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HARUKAWA (C.) & KUMASHIRO (S.). **Heat as a Means of Controlling the Angoumois Grain-Moth (I.).**—*Ber. Ōhara Inst.* **6** no. 3 pp. 393–406, 1 graph, 6 refs. Kurashiki, 1934.

In Japan, *Sitotroga cerealella*, Ol., causes very great damage to stored grain, especially wheat and barley. Fumigation is the usual method of controlling it, and for this purpose carbon bisulphide has recently been replaced by chloropicrin, applied at the rate of $\frac{1}{2}$ –1 lb. per 1,000 cu. ft. approximately, with an exposure of 2–3 days. As, however, it has not always proved successful, experiments, here described in detail, have been made on treatment by heat, using an electric incubator.

The following is largely taken from the summary : At 60°C. [140°F.], a five minutes exposure killed the eggs, but 1–1½ hours was necessary to ensure complete mortality of larvae and pupae. At 80°C. [176°F.], however, only 15–20 minutes were required to kill almost 100 per cent. All the tests were made by mixing infested grains with about 15 cc. of uninfested wheat, and placing the mixture in a muslin bag in the incubator. Some time was necessary to permit the heat to reach every part of the material, so that even at 80°C. complete mortality was not effected by heating for 10 minutes or less. It thus appears that to kill larvae and pupae a longer exposure and a higher temperature are required than had previously been thought [*R.A.E.*, A **20** 224, etc.].

Germination tests indicated that seeds of wheat and barley are not affected by heat if they are well matured and dry. The exposures tested included 20 minutes at 80°C. and 1½ hours at 60°C.

HARUKAWA (C.) & KUMASHIRO (S.). **Studies on Fumigation with Chloropicrin.**—*Ber. Ōhara Inst.* **6** no. 3 pp. 407–430, 1 fig., 14 refs. Kurashiki, 1934.

In tests of the effectiveness of chloropicrin for the control of *Sitotroga cerealella*, Ol., in wheat and barley in Japan [*cf.* preceding paper], a rectangular wooden box about 14 inches square in cross section and 6½ ft. high was filled with grain up to 2½–1 ft. of the top. Eggs and larvae in containers were placed at 2 or 3 positions in the column of grain. The chloropicrin was in a dish attached to the inner surface of the cover of the box. The experiments are described in detail and the results tabulated.

The following is taken from the summary : The eggs were killed by fumigation for 48 hours with a weak dosage equivalent to $\frac{1}{4}$ lb. per 1,000 cu. ft., but at least $\frac{1}{2}$ lb. was required to kill all full-grown larvae and pupae. When the box contained a large quantity of grain, the downward movement of the gas was greatly retarded, and at a depth of about 5 ft. below the surface only a very small percentage of the fully grown larvae were killed in 96 hours with 2 lb. per 1,000 cu. ft. After 24 hours larvae survived at a depth of 3½ ft. This showed that all the larvae would not be killed under the conditions of practical fumigation of heaped grain. To afford a passage for the gas the fumigation box was fitted with a pipe running down the centre, round which the grain was filled in. This pipe was rectangular and about 3 inches in section and had 2 or 3 saw-cuts about 18 inches apart on its four edges. By its use a mortality of 93–99 per cent. for all stages was obtained in 72 hours with 1½–2 lb. per 1,000 cu. ft. At a high air temperature, (27°C. [80·6°F.] or higher) nearly the same result was obtained with 1 lb.

Comparative tests were made with *Calandra oryzae*, L. The adult weevils seemed slightly more susceptible than the larvae of *S. cerealella*, nearly all being killed in 72 hours with 1 lb. when the air-temperature was above 22°C. [71.6°F.].

Germination of barley was reduced by 20–30 per cent. by fumigation for 72 hours with 1 lb., but that of wheat was almost unaffected by this treatment if applied after July. It is not advisable to fumigate wheat or barley before the end of July, nor for longer than 72 hours, as the increase in effectiveness is slight and the injury to the grain is considerable.

BREDO (H. J.). **La lutte contre le ver rose (*Pectinophora gossypiella* Saund.) par la désinfection des graines de coton au moyen d'appareils à air chaud.**—*Bull. agric. Congo belge* **25** no. 2 pp. 250–270, 3 figs., 4 graphs, 7 refs. Brussels, June 1934. [Recd. February 1935.]

In the Belgian Congo, as in Tanganyika, no long-cycle larvae of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., have been found among double seeds at the end of the cotton season. As, however, the introduction of *P. gossypiella* into the Belgian Congo is so recent [*R.A.E.*, A **20** 70, etc.], the biology of the larva is liable to undergo further modifications as it becomes adapted to the new environment. The author therefore discusses, mainly from tests conducted in Egypt and from the literature, the disinfestation of the seeds by hot air. Two types of apparatus (including one already noticed [4 491]) used in Egypt, both fitted with a heat regulator, an automatic feeder and a thermograph, are compared. Experiments in the Belgian Congo showed a machine without an automatic feeder to be inefficient, as heat penetrates heaped seeds with difficulty, and they must therefore be kept in motion and exposed for some length of time. In practice the temperature is measured at the exit of the apparatus, but when this temperature is 50°C. [122°F.] that of the interior may be above 100°C. [212°F.]. The exit thermometer may register 65°C. [149°F.] if the seed is dry, but only 60°C. [140°F.] if it is moist.

In Texas [*cf.* **10** 539] tests indicated that the temperature destroying the germinating power lies near 74°C. [165°F.]. Nevertheless the seed can survive very high temperatures provided that the exposure is not too long. Germination of 93 per cent. was observed 90 days after a one minute exposure to 160°C. [320°F.]. An exposure of 3 minutes to 58°C. [136.4°F.], under ideal laboratory conditions, gives complete mortality, but in actual practice an exposure of 3½ minutes to 63°C. [145.4°F.] registered at the exit of the apparatus was necessary.

In Egypt [*cf.* **3** 505 ; **4** 472] treatment is effected at 55°C. [131°F.], and the seed is placed for 5 minutes in the apparatus with a subsequent period of 2 hours in large sacks. If the seed is not put into sacks, the temperature should be at least 65°C. The seeds retain their germinating power after exposure to temperatures as high as 70°C. [158°F.]. Higher temperatures would be required in the Belgian Congo, where the seeds are not so dry as in Egypt. In experiments in the Belgian Congo, the temperature among seeds left in sacks in the disinfecting room rose by 7–11.5°C. [12.6–20.7°F.], and by 6.5–7°C. [11.7–23.5°F.] when they were placed in the shade outside the factory. In one case it rose by 16.5°C. [29.7°F.].

In a sack of seed that had been disinfested by hot air and in which the temperature rose from 55 to 65°C. [131–149°F.] pupae of the bollworm

put in the sack all died within two hours. As no double seeds were available, the pupae were placed loose among the test seeds. The importance of putting the seed in sacks after exposure to the heat is thus clearly demonstrated. It appears that the heat stored in the seeds during their passage through the apparatus is isolated by the thick layer of lint and the heavy cortical layer of the seed. After the seed is placed in the sacks, this heat is regenerated in the interior.

WOLTERS (W.). **Measures for the Control of *Anomala orientalis* at the Oahu Sugar Company, Ltd.**—*Hawaii. Plant. Rec.* **38** no. 4 pp. 264–278. Honolulu, 1934.

An account is given of comprehensive investigations carried out during 3 years on the control of *Anomala orientalis*, Waterh., in sugarcane fields in Hawaii in view of the reduced efficiency of the introduced parasite, *Scolia manilae*, Ashm. [*cf. R.A.E.*, A **22** 146].

The following is based on the author's summary: Treatment of the soil with chloropicrin, carbon bisulphide and paradichlorobenzene, contact insecticides, including powdered derris root, and an electric plough proved unsatisfactory, and in experiments, the larvae were not affected by subjection to X-rays. White arsenic, which is as toxic as lead arsenate and less costly, gave the best results. It does not injure the plants even after heavy applications and remains effective in the soil for at least two years [**22** 137]. It was applied with success in the following ways: broadcast in the furrows of growing cane or ploughed into infested land; mixed with mud-press (which is attractive to the ovipositing females and to the larvae) and placed as traps round the edges of fields exposed to infestation, applied to the furrows, or ploughed into the soil; mixed with any dry fertiliser and applied to the cane furrows; or worked into the mud-press collected in the waterways, which are particularly attractive for oviposition. Where the severity of the infestation prohibits the economical use of chemicals, the land may be ploughed and left fallow until the population has disappeared or been reduced to sufficiently low proportions to be kept in check by parasites.

Scolia has recently been observed to be adversely affected by cold, wet weather occurring early in the year. Species of *Elis*, received from Guatemala, especially one allied to *E. pulchrina*, Cam., and *Tiphia* were liberated in August 1934. Larvae of a predatory wireworm, *Pyrophorus* sp., were also obtained from Guatemala. The distribution of the toad, *Bufo marinus* [**22** 137], has been extended.

The Fruit Tree Pests (Kent) Order of 1935.—*S. R. O.* 1935, no. 61, 4 pp. London, 25th January 1935.

The Fruit Tree Pests (Berkshire) Order of 1935.—*S. R. O.* 1935, no. 183, 4 pp. London, 9th March 1935.

The first of these Orders empowers Local Authorities to examine any fruit trees, etc., in Kent, in respect of which a complaint has been made that they are suspected of being affected by any of the following pests: apple sawfly [*Hoplocampa testudinea*, Klug], apple sucker [*Psylla mali*, Schmid.], black currant mite [*Eriophyes ribis*, Nal.], Capsids, codling moth [*Cydia pomonella*, L.], raspberry beetle [*Byturus*

tomentosus, F.), winter moth [*Cheimatobia brumata*, L.] and fruit-tree Aphids [cf. *R.A.E.*, A 23 128]. The second gives similar powers to the Local Authorities of Berkshire in respect of the same pests with the addition of fruit-tree red spiders [*Paratetranychus pilosus*, C. & F.].

CARROLL (J.) & McMAHON (E.). **Development of an improved Type of Winter Spray for Orchards.**—*J. Dep. Agric. [Irish Free St.]* 33 no. 1 pp. 48–52, 3 refs. Dublin, 1935.

As a result of experiments carried out in Dublin in 1931 against apple pests [*R.A.E.*, A 21 4], four combination sprays of tar distillate and mineral oil, one of which was proprietary, were tested in the laboratory. A new method of counting the eggs and the manner in which the twigs were kept after spraying and examined are described. When applied at a concentration of 10 per cent. in January 1933, these sprays gave complete control of the eggs of Aphids and more than 99 per cent. control of those of apple sucker [*Psylla mali*, Schmid.]. The proprietary spray, which was the same as that used in 1931, killed only 87 per cent. of the eggs of the red mite [*Paratetranychus pilosus*, C. & F.], while the others killed $98\frac{1}{2}$ – $99\frac{1}{4}$ per cent.

The most suitable of these sprays, containing 50 per cent. tar distillate and 25 per cent. light lubricating oil, was tested in 1934 and has since been put on the market. In the laboratory, all the Psyllid and Aphid eggs and 95·3, 97·5 and 98·1 per cent. respectively of those of the mite were destroyed by concentrations of 6, 8 and 10 per cent. In the field, an 8 per cent. spray gave results in agreement with the laboratory trials. When the spray was applied to apple trees at concentrations of 8, 10 and 12 per cent., the buds were not harmed, even though some of the shoots were dipped in it, and an 8 per cent. spray did not injure currants or gooseberries.

FRYER (J. C. F.). **Colorado Potato Beetle at Tilbury—II.**—*J. Minist. Agric.* 41 no. 11 pp. 1058–1062, 1 map. London, February 1935.

Ten further infestations by the Colorado potato beetle [*Leptinotarsa decemlineata*, Say], which was found in Essex in 1933 [*R.A.E.*, A 22 115], were discovered within about a mile of Gravesend on the opposite bank of the Thames early in 1934 during the examination of over 2,000 tons of soil. The soil in each place and the surrounding area was treated with carbon bisulphide. All potatoes within 10 miles of any infested place were kept under observation from early May and throughout the summer; field crops within about 6 miles of an infested locality (about 4,000 acres) were sprayed with an arsenical between 5th June and 5th July, and a derris spray was applied in all allotments and gardens in that area.

During the summer it became clear that the winter campaign had been successful; a few dead beetles were found in treated soil in early spring, but only two living ones were observed, one in May and one in July, in or near infested sites in Essex. It will be necessary, however, to continue inspection for at least 12 months, although precautionary sprays will probably not be needed during 1935.

PETHERBRIDGE (F. R.) & THOMAS (I.). **The Control of Flea Beetles in Seed-beds.**—*J. Minist. Agric.* **41** pp. 1070–1078, 1 pl., 2 refs.; correction p. 1154. London, February 1935.

As a result of the severe damage caused to crucifers by flea-beetles in 1930, a series of experiments were conducted on their control in the market-gardening areas of Bedfordshire. Further heavy infestation in 1934 made it possible to get fairly conclusive results. The species involved were *Phyllotreta undulata*, Kutsch., *P. punctulata*, Marsh., *P. consobrina*, Curt., *P. atra*, F., *P. nigripes*, F., and *P. cruciferae*, Goeze, all of which feed in the larval stage on the roots of the plants, and *P. nemorum*, L., which mines in the leaves [*cf. R.A.E.*, A **16** 616]. Seed-beds may sometimes have to be re-sown two or three times. Many beetles were attracted to trap crops, particularly of white turnips, sown alongside cabbages. It is thought that overwintered beetles might be attracted to white turnips sown along the hedgerows of fields where they could be killed in large numbers with a derris dust before the plant beds could be infested.

Experiments were carried out with various dusts in spring in 1931 and 1934 in several localities.

The following is based on the authors' summary: Medium and light derris dusts containing 0.2 per cent. rotenone gave the best results, the latter protecting about 80 per cent. of the cauliflower plants in two areas when used at the rate of about 65–85 lb. per acre; this dust is the cheaper, since a smaller quantity is required. Hydrated lime is useful if applied frequently in large quantities. Nicotine gave fair results but is expensive. Naphthalene applied before the plants appear above ground may prevent the early subterranean attack, which causes great injury [*loc. cit.*]. In seasons when damage is severe, the beds should be prepared with as fine a tilth as possible and then receive applications of naphthalene or derris dust about 4–5 days after sowing. Light derris dust should be used as the plants are coming through the ground and afterwards derris dust every 3–5 days, depending on the weather and the intensity of infestation. As many as 5 applications may be necessary. The seed-beds should be watched carefully and during fine weather should be examined twice a day; they may be free from infestation in the morning and severely attacked by evening. About 30 lb. light derris should be applied per acre at one application if the plants are in drills about $2\frac{1}{2}$ ft. apart.

MILES (H. W.). **The Control of Flea Beetles with a Naphthalene-Silica Dust.**—*J. Minist. Agric.* **41** no. 11 pp. 1079–1083, 2 pls. London, February 1935.

During 1933 and 1934, *Chaetocnema concinna*, Marsh., *Phyllotreta nemorum*, L., and *P. undulata*, Kutsch., caused serious injury in Lancashire and Cheshire to cruciferous seedlings in gardens, seed-beds and fields, where the cotyledons were destroyed as soon as they appeared above ground and frequently before. Tests were made in 1934 with a dust of equal parts of pure naphthalene and colloidal silica, applied where possible as the seeds were just breaking the surface soil on the top of the drill rows but also when they had already appeared and subsequently every 3–4 days. When swedes, in drills 28 ins. apart, were dusted at the rate of about 55 lb. per acre on 28th and 31st May and

4th June, there were over two and a half times as many seedlings on the dusted drills as on the controls, which were nearly 3 times as heavily infested. The cotyledons on all the dusted plants were entire, whereas only 22 per cent. of the seedlings that became established on untreated plots had cotyledons, and many of these were badly damaged. The superiority of the dusted plots was maintained and by thinning time they were estimated to bear about 4 times as much leaf surface. When brussels sprouts that had already come through the surface were dusted on 22nd and 28th May and 3rd June, the crop was greatly improved, but dusting at an earlier stage is recommended. Under normal conditions an acre may be treated by two men with knapsack dusters in $1\frac{1}{2}$ hours.

MILES (H. W.). **Control of Insect Pests of Vegetable Crops.**—*Sci. Hort.* **3** pp. 126–132, 3 refs. Wye, Kent, S.E. agric. Coll., 1935.

An account is given of measures for use on vegetable crops in England for the control of such polyphagous pests as wireworms, Tipulids and cutworms, and of specific pests such as the cabbage root fly [*Phorbia brassicae*, Bch.] and flea-beetles on crucifers, the Aphids, *Myzus persicae*, Sulz., and *Brevicoryne brassicae*, L., which cause serious damage to cabbages, carrots and beets, *Psila rosae*, F., on carrot, parsnip, parsley and celery, *Hylemyia antiqua*, Mg., on onions, *Pegomyia hyoscyami*, Panz., on beet, and *Acidia heraclei*, on celery. The author stresses the importance of routine measures, for which repellent dusts appear suitable. Crucifers may be protected from flea-beetles by the application of flake naphthalene during sowing at the rate of 4 oz. to 1 lb. seed and of dusts of naphthalene or derris at the rate of 30–40 lb. per acre as the seeds are breaking through the soil [cf. preceding papers]. Two or three applications may be necessary. Derris has the additional advantage of being toxic as well as repellent.

HODSON (W. E. H.). **Control of Insect Pests of Bulbs : A Survey of Recent Work.**—*Sci. Hort.* **3** pp. 192–196. Wye, Kent, S.E. agric. Coll., 1935.

Brief notes are given on the bionomics and control of *Merodon equestris*, F., *Eumerus tuberculatus*, Rond., and *Tarsonemus approximatus* var. *narcissi*, Ewing, which are major pests of narcissus bulbs in England. *Liothrips vaneecki*, Priesn., is becoming established on lilies, which it attacks between the scales of the bulbs and often kills. It is common on imported bulbs, but is easily destroyed by fumigation before planting.

TRÄGÄRDH (I.) & BUTOVITSCH (V.). **Redogörelse för barkborrekampanjen efter stormhärjningarna 1931–1932.** [Report on Measures against Bark-beetles after the Storm Devastations of 1931–1932.]—*Medd. Skogsförsöksanst.* **28** no. 1 pp. 1–268, 60 figs., 2 pp. refs. Stockholm, 1935. (With a Summary in German.)

The effects of three severe storms that devastated the pine and spruce forests of central and southern Sweden in 1931 and 1932 and their results on the incidence of bark-beetles are outlined. The damage

done by these was minimised in those cases where it was possible to remove the fallen timber in time. An account is given of the organisation and execution of the entomological work, the methods of estimating infestation, the results of the examinations, experiments with trap-logs and in preserving timber by stacking in the forest, and investigations on piles of timber cut for firewood as a factor in the increase of the bark-beetles.

In Uppland in the summer of 1932, 4-cm. strips of bark were removed from all pieces of timber over 4 inches in diameter in order to increase the resinous smell that attracts the beetles and at the same time to destroy consequent infestation by quicker drying. This was very satisfactory with spruce, as was shown by an instance in which 97 young individuals of *Ips typographus*, L., were taken from spruce thus treated, as against 2,075 from unbarked spruce. With pine, however, this method, which produced only a 34 per cent. reduction in the numbers of *Myelo-philus* (*Blastophagus*) *piniperda*, L., is not worth while, as complete removal of the bark, which only costs twice as much, ensures almost total destruction.

When preventive measures were no longer of use, attention was turned to the ecology of the various species. *I. typographus* increased more in storm-gaps than over wider storm-felled areas. There were 56,000 per acre on uncleared fellings, 180,000 on partly cleared, and none in areas that had been cleared in good time. The corresponding figures for *M. piniperda* were 60,000, 28,800 and 2,000, the size of the felled area being immaterial; the comparatively small numbers in partly cleared places was due to the fact that the pines, especially those with coarse bark, had been removed first. As there were plenty of breeding places, standing trees were not attacked except in one forest. Here the ground had been cleared, but the stacked timber had not been carted away, and *I. typographus* reached a record abundance of 520,000 per acre. Owing to favourable weather two generations were produced, and those young adults of the first that emerged early attacked the edges of the stands.

In the absence of trap-logs and other breeding facilities, standing trees, usually those exposed to sunshine, were attacked. In places where the timber was cut up and carted away in good time, no newly attacked trees were found, and there were few beetles, chiefly *Hylastes palliatus*, Gyll., *Dryocoetes autographus*, Ratz., *Pissodes*, etc., while *I. typographus* was almost absent. Conditions were, however, very different in places where clearing was not finished before mid-summer in 1932. As a rule, trees were not attacked if other breeding places were available in the summer of 1933, but if all the fallen timber had been removed before the flight-period of 1933, *I. typographus*, accompanied by *I. (P.) chalcographus*, L., and later by *Polygraphus poligraphus*, L., regularly attacked the trees. Trap-logs should be made from trees at least 8 inches in diameter $4\frac{1}{2}$ ft. from the ground. Thick stems with thick bark are preferable. *I. typographus* usually attacked the parts of the tree more than 3 ft. above the ground, while *M. piniperda* preferred the basal portion not more than three feet from the ground, and it appeared to prefer bark 2 cm. thick. The best spruce trap-logs were from dominant trees likely to be thinned or cleared because their wood was technically defective. If possible, the logs should be felled under shade, and if they are for use against *I. typographus*, they should be cut from the northern and eastern edges of the stands and some weeks before the flight period. If they are meant for *M. piniperda*, they

should be felled in January-March. Wind-felled trees should be cut into trap-logs in early spring, and the bark must be stripped from the logs as soon as the larvae are observed to be ready to pupate. A formula is given for calculating the log-surface required in accordance with the density of infestation.

Owing to the enormous number of storm-felled trees, experiments were made to ascertain the best conditions for conserving timber stacked in the forests. A mixture of moss and faggot-wood formed the best covering. It protected the stacks against beetles that need light, such as *I. typographus*, *I. chalcographus*, *Myelophilus* (B.) *minor*, Htg., *I. proximus*, Eichh., and *Monochamus sutor*, L., but was useless against those infesting the roots, such as species of *Hylastes*, *Hylobius* and *Dryocoetes*. A covering 19 inches thick was not always proof against *Myelophilus piniperda*. As insects and fungi occurred chiefly on the surface, the percentage of infestation decreased with the size of the stack. Pine was more susceptible than spruce and is not suited for stacking in forests. Uncovered stacks provided easy access to pests, and it is better to leave the trees lying as they fell. Bark-infesting species perished in stacked timber from which strips of bark had been peeled, but *Xyloterus lineatus*, Ol., appeared to prefer such wood and developed in it normally.

Bark-beetles bred in wood cut up for fuel, if it was piled in the shade. In piles exposed to sunshine the mortality was considerable when the wood had been cut up early. For instance, *I. chalcographus* suffered a mortality of 78, 40 and 17 per cent. in wood cut up in April, May and June, respectively. None died in wood that had been cut up in July. In wood cut in spring and early summer, the mortality of *I. typographus* increased from 9.5 per cent. in bark 8.5 mm. thick to 47 per cent. in bark 3.5 mm. thick. For *I. chalcographus* the mortality rose from 2 per cent. in bark 5.5 mm. thick to 54 per cent. in bark only 2.5 mm. thick. The percentage of pieces infested was greatest (32) in the second layer from the top of the pile. In the top layer it was 22, and it fell to 12 in the third and 7.5 in the fourth, while the fifth layer was seldom infested. The mortality from the top layer downwards was 50, 33, 26 and 17.5 per cent. Firewood should be cut up early, in winter if possible, and stacked away from shade. Later cutting, especially if the wood is already infested, may cause the beetles to increase because the wood will not have had time to dry before they develop on it.

Die wichtigsten starken Schäden an Kulturpflanzen im Jahre 1934.

[The chief severe injuries to cultivated plants in 1934.]—*NachrBl. dtsh. PflSchDienst* **14** no. 12 pp. 115–118; **15** nos. 1–3 pp. 9–10, 15–19, 29–33, 2 graphs, 21 maps. Berlin, December 1934 & January–March 1935.

Records of insect pests from various localities in Germany constitute a large part of this list.

URBAN (C.). *Tychius meliloti* Steph. und *T. crassirostris* Kirsch.—*Ent. Bl.* **31** no. 1 pp. 24–29. Krefeld, February 1935.

Observations in Germany on *Tychius* spp. attacking *Melilotus* showed that the larvae of *T. meliloti*, Steph., do not live in leaf-galls, as had been supposed, but in the pods, as do those of *T. flavicollis*, Steph. The larvae in leaf-galls are those of *T. crassirostris*, Kirsch.

RUEDIGER (E.). **Massenaufreten des Bienenwolfs 1934.** [Mass Occurrence of *Philanthus triangulum* in 1934.]—*Ent. Rdsch.* **52** no. 6 pp. 57–58. Stuttgart, 15th March 1935.

The occurrence of swarms of the Sphegid, *Philanthus triangulum*, F., is recorded from Holland and various districts, especially moors, in Germany in 1934, in such numbers as to be a danger to bee-keeping [cf. *R.A.E.*, A **20** 598; **22** 341, etc.]. The adults chiefly occur in July and August. In one district in one year 60,000 individuals were taken in nets, representing a saving of a million bees.

RIGGERT (E.). **Untersuchungen über die Parasiten der Fritfliege.** [Investigations on the Parasites of the Frit Fly.]—*Arb. physiol. angew. Ent. Berl.* **2** no. 1 pp. 1–23, 4 figs., 25 refs. Berlin, February 1935.

Observations on several parasites of *Oscinella frit*, L., at Kiel are described and compared with the literature. The Nematode, *Tylenchinema oscinellae* [R.A.E., A **18** 567], infested 19 out of 990 adult flies in 1930, and 109 out of 1,251 in 1931, and prevented them from producing eggs. A mite, *Microtrombidium demeijerei*, Oudms., which has also been recorded from *Anthomyza gracilis*, Fall., and *Platyparea poeciloptera*, Schr., was observed in July and August 1931. The mite larva bores into the abdomen of the fly and prevents development of the eggs. Only 3–6 per cent. of the flies were parasitised.

A number of Hymenopterous parasites were bred from pupae of *Oscinella*, which had been collected as larvae or pupae, but their effect was unimportant. The rate of parasitism was much higher in material from meadow grasses or seedlings than in that from the ears of barley and oats, where the larvae are well protected against attack. The species obtained were *Chasmodon apterus*, Nees, and *Eucoila* (*Rhoptromeris*) *eucera*, Htg., which were the most important, *Pseudeucoila* sp., *Loxotropa tritoma*, Thoms., *Ashmeadopria* sp., *Halticoptera aenea*, Wlk. (*fusicornis*, Wlk.), *Trichomalus cristatus*, Först., *Callitula bicolor*, Spin., *Cyrtogaster vulgaris*, Wlk., and *Spalangia* sp. (? *nigra*, Latr.).

THIEM (H.). **Untersuchungen zur Biologie der Kirschfruchtfliege (*Rhagoletis cerasi* L.) und ihrer Wirtspflanzen.** [Investigations on the Biology of the Cherry Fruit-fly and of its Food-plants.]—*Arb. physiol. angew. Ent. Berl.* **2** no. 1 pp. 24–49, 1 fig., 13 refs. Berlin, February 1935.

A full account is given of observations made in 1933 and 1934 in Berlin-Dahlem on *Rhagoletis cerasi*, L. They deal with adult emergence [R.A.E., A **22** 247], egg-maturation, oviposition, egg-development, duration of total development in the fruits, pupal stage and wild food-plants.

The following is taken largely from the summary: On an average there were 133 males to 100 females. In favourable conditions of food and temperature a small number of females had mature eggs in 8 days and a large number had none mature after 17 days. Unfavourable weather delayed egg-maturation and decreased fertility. Females sometimes punctured cherries and other fruits before they were ready to oviposit. Very favourable weather caused sudden deposition of eggs.

Half-ripe fruits were preferred, but eggs were laid also in green and ripe fruits. Egg-development in green fruits lasted longer than in half-ripe and ripe ones; in 1933 and 1934 it required 10–13 days in the field. In 1933 the total larval development averaged 20–22 days. The mature larvae pupated more quickly in moist ground than in dry ground. Larval development was the same in cherry and in *Lonicera tatarica*. Some pupae hibernated three times without suffering any harm.

While many eggs were laid in the fruits of *Prunus mahaleb*, only a few larvae and pupae were produced. From eggs laid in the fruits of *Prunus padus* neither normal mature larvae nor pupae were obtained. Eggs were laid in the fruits of *Mahonia aquifolium*, but they did not develop. The species of *Lonicera* that were attacked are set out in a list. Species of *Lonicera* that were not attacked were for the most part early or late ripening or creeping species.

SCHIMITSCHEK (E.). **Die Forstentomologie in Oesterreich.** [Forest Entomology in Austria.]—*Arb. physiol. angew. Ent. Berl.* **2** no. 1 pp. 50–52. Berlin, February 1935.

Notes are given on the development of the training of students in forest entomology in Austria and on work done against forest pests.

THOMSEN (M.). **Ueber die Organisation der angewandten Entomologie in Dänemark.** [On the Organisation of applied Entomology in Denmark.]—*Arb. physiol. angew. Ent. Berl.* **2** no. 1 pp. 52–55. Berlin, February 1935.

This paper [*cf.* also *R.A.E.*, B **23** 000] includes a brief account of the development of forest and agricultural entomology in Denmark.

MAERCKS (H.). **Ueber die Wirkung von Nikotin und Pyrethrum auf die Eier des Apfelwicklers (*Carpocapsa pomonella* L.) und des bekreuzten Traubenwicklers (*Polychrosis botrana* Schiff.).** [The Action of Nicotine and Pyrethrum on the Eggs of *Cydia pomonella* and *P. botrana*.]—*Anz. Schädlingsk.* **11** no. 2 pp. 13–19, 5 figs., 7 refs. Berlin, February 1935.

The effect of nicotine and pyrethrum on the eggs of *Cydia* (*Carpocapsa*) *pomonella*, L., and *Polychrosis botrana*, Schiff., was ascertained in a series of experiments with aqueous solutions containing 0.5 per cent. nicotine or 0.01 per cent. pyrethrin, into which the eggs were dipped for 15 seconds at a temperature between 18 and 24.3°C. [64.4 and 75.74°F.]. The eggs were at five different stages of development. Some were rinsed immediately after dipping, while on others the solution was allowed to dry.

Published work on the effect of nicotine on the eggs of both insects is reviewed. Nicotine did not affect the embryonic development of *C. pomonella*, as the egg envelope stopped it from penetrating. Larvae hatched from nearly all the eggs rinsed after dipping. In the batches on which the nicotine dried, however, its action on the larvae in the process of hatching was very marked. There were mortalities of 97.3 and 97.5 per cent. in the case of eggs dipped in the two stages preceding hatching. In the earlier stages the mortality decreased as the period between dipping and hatching lengthened. The few larvae that

hatched completely from eggs dipped in the fifth stage died immediately after. The larvae were killed when gnawing through the egg-envelope, so that the nicotine apparently acted as a stomach poison. It seemed also to have the effects of a contact poison on those larvae that succeeded in leaving the egg and moved on the film of nicotine on it and on its support. The effects of nicotine on *P. botrana* were similar, but more marked. With both insects it remained active for about 6 days and delayed the hatching of larvae that survived.

No previous information existed as to the effect of pyrethrin on the eggs of either species. As with nicotine, the envelope of the egg protected the embryo, and the larvae were poisoned as they gnawed their way out. When the eggs of *C. pomonella* in the five successive stages of development were rinsed, the percentages of larval mortality were 0, 6.5, 30.8, 42.2 and 55.1, respectively. Traces of pyrethrum appeared to be retained despite the immediate rinsing. When the pyrethrin was allowed to dry, its effect was greater. Only 2.2 per cent. of the larvae survived from eggs dipped in the fifth stage. Like nicotine, pyrethrin appeared to act both as a stomach and contact poison, but it permitted a higher percentage of larvae to complete hatching before they died. Analogous results were obtained with *P. botrana*.

The high mortality caused by nicotine indicates its practical value. Moore has found that nicotine tannate remains effective after 20 days exposure in the field [*cf. R.A.E., A* 20 515].

FRIEDERICH (K.). **Folgerungen aus den neuen Untersuchungen über die Forleule.** [Conclusions from recent Investigations on the Pine Moth.]—*Anz. Schädlingssk.* 11 no. 2 pp. 19–23, 1 fig., 8 refs. Berlin, February 1935.

Observations on the epidemiology of *Panolis flammea*, Schiff., on pines in Mecklenburg and in parts of Germany further to the east or in Bavaria, where infestation is more severe, are compared. In heavily infested regions, the collapse of an outbreak is at once followed by a gradual increase, leading to a fresh outbreak after about 10 years. The sum of the average monthly temperatures in May, June and July, the months of larval feeding, are higher than in Mecklenburg. Records show that the average temperature for these three months ranged from 15.1–16.1°C. [59.18–60.98°F.], whereas in Mecklenburg it reached only 14.6°C. [58.28°F.]. It is only when warm continental weather replaces the prevailing marine conditions for some time that *P. flammea* can flourish at all in Mecklenburg, and even then it only does well in warm parts of the forests. In the regions where injury is worst, the average annual rainfall is somewhat smaller than in Mecklenburg. Unknown factors must explain exceptional cases where constant injury by *P. flammea* does not occur although temperature and rainfall are favourable.

ZOLK (K.). **Massenaufreten der Fritfliege in Eesti im Herbste d.J. 1934.** [An Outbreak of the Frit Fly in Estland in the Autumn of 1934.] [*In Estonian.*]—*Mitt. VersSta. angew. Ent. Univ. Tartu* no. 31 7 pp., 2 graphs. Tartus, 1935. (With a Summary in German.) (Repr. from *Agronomiia*, 1935, no. 1.)

The following is taken from the author's summary: *Oscinella frit*, L., which had previously attracted little attention in Estonia, caused

considerable damage in a number of districts to early sown winter rye in the autumn of 1934. The outbreak was chiefly due to the drought in August, which retarded the development of the plants. In the field of the Experiment Station near Tartu the highest rate of infestation occurred in rye sown on the 10th August, 79.4 per cent. of the plants being destroyed and 65.6 per cent. of the remaining shoots injured. The corresponding percentages for rye sown on 20th and 30th August and 10th September were 73.2 and 63.5, 29.5 and 46.7, and 0.3 and 10.7, respectively, and infestation in rye sown on 20th September was limited to a few plants only.

KALANDRA (A.) & PFEFFER (A.). **Ein Beitrag zum Studium der Ulmen-graphiose.** [A Contribution to the Study of Dutch Elm Disease.] [In Czech.]—*Lesn. Práce* **14** reprint 17 pp., 4 pls., 69 refs. Písek, 1935. (With a Summary in German.)

In Czechoslovakia, Dutch elm disease caused by the fungus, *Ceratomyces (Graphium) ulmi*, was first observed in the Province of Bohemia in 1931 and has since spread to other Provinces. The elms attacked are *Ulmus campestris*, *U. effusa* and, to a less extent, *U. montana*. The symptoms and distribution of the disease are briefly reviewed, and the part played by Scolytids in its spread is discussed from the literature. The fungus is easily transmitted by them, since spores were found in the digestive organs of both larvae and adults and on the surface of the latter. Brief notes are given on the bionomics of eight species of Coleoptera found to be responsible for transmitting the disease in Czechoslovakia. Of these *Scolytus multistriatus*, Marsh., *S. scolytus*, F., and *S. pygmaeus*, F., are the most important since they produce two generations a year; *S. laevis*, Chap., *Hylesinus (Pteleobius) vittatus*, F., *H. (P.) kraatzii*, Eichh., and the weevil, *Magdalis armigera*, Geoffr., are very prolific though they have only one generation a year; and the Lamiid, *Saperda punctata*, L., is the least important, as it requires two years to complete its life-cycle. All these beetles, except *S. laevis*, were observed on *U. campestris* and *U. effusa* from May to August. *S. laevis* was only found on *U. montana* in July. *S. ensifer*, Eichh., *S. kirschi*, Skal., *S. demaisonii*, Egg., and *S. multistriatus* var. *triornatus*, Eichh., were also associated with diseased elms, but their relation to the infection was not established.

Favourable conditions for bark-beetles were created by the weakening of elms as result of the severe winter of 1928–29, a decrease in the abundance of birds, and the accumulation in forests of large numbers of felled unbarked trees. A brief estimate is given of the losses caused by the disease. All infested trees, including those that have been only slightly attacked by the beetles, should be cut down and barked or submerged in water for several weeks to destroy the larvae and pupae. Felling completely dry trees already abandoned by the beetles is useless.

Elm trees killed by the fungus were also found in July 1934 in Bulgaria, the beetles involved including some of the species occurring in Czechoslovakia as well as *S. sulcifrons*, Rey, and *S. affinis*, Egg., which in southern Bulgaria take the place of *S. scolytus* and *S. multistriatus* respectively.

KOLUBAJIV (S.). **Die Ergebnisse der Züchtung von parasitischen Insektenarten aus ihren Wirten in der staatlichen Versuchsanstalt in Prag in den J.J. 1929–1933.** [The Results of Breeding parasitic Insect Species from their Hosts in the State Experiment Institute in Prague in 1929–33.] [In Czech.]—*Acta Soc. ent. Čsl.* **31** pp. 59–68, 113–120, 155–163, 37 refs. Prague, 15th May and 15th December 1934. (With a Summary in German.) [Recd. March 1935.]

A list, arranged in systematic order under hosts, is given of a large number of insect parasites reared in Prague from the larvae or pupae of various forest pests. Almost all the material was obtained from Czechoslovakia. The frequency of occurrence and places of origin of the parasites are shown, and in some instances brief notes on their bionomics are included. Many of the host records are new. In the case of the nun moth, *Lymantria monacha*, L., predacious insects are also mentioned.

POLIZU (S.). **Insectele dăunătoare stânjeneilor.** [Insects injurious to Irises.]—*Rev. horticola* no. 143 pp. 3–5; no. 144 pp. 26–28, 2 figs. Bucarest, 1st January & 1st February 1935.

Irises in Rumania were found to be attacked by *Rhadinoceraea micans*, Klug (*iridis*, Kalt.), *Phorbia* (*Amthomyia*) *trapezina*, Zett., *Epicometis* (*Tropinota*) *hirta*, Poda, and *Myzus* (*Myzodes*) *persicae*, Šulz.

Notes are given on the bionomics of the first two as observed during 1923–34. Both produce one generation a year. The adults of *R. micans* usually emerge in late April or early May and are present for about 3 weeks. These sawflies lay their eggs 4–7 days after pairing in slits made in the leaves. The larvae hatch in 3–6 days and feed gregariously on the parenchyma of the leaves for 3–4 weeks. On dull and cold days they curl up at the base of the leaves. Having destroyed the leaves on one plant, they migrate to another. The optimum temperature for their development is 32°C. [89·6°F.]. They enter the soil about the end of June and form their cocoons 1½–3 ins. below the surface. Infested plants should be sprayed with an arsenical while the larvae are still young.

The adults of *P. trapezina* emerge at the end of April or in May and feed for 3–4 days on the nectar of various early flowers, before pairing. They lay their eggs 3–6 days later on the leaves near the flower buds of irises or among the small leaves covering them. The larvae hatch in 2–4 days and penetrate into the buds. From 2 to 5 are usually present in a bud. Since the larvae generally differ in size, the eggs are probably laid at various times. The author has also found larvae in the stalks of inflorescences. They reach maturity in 14–18 days and at the end of May or in the first half of June enter the soil, where they pupate and hibernate. Infested buds do not open and look as if they had been scorched; those already abandoned by the larvae are dry and shrivelled.

Infested buds should be collected and burnt, and the soil round the plants should be hoed in the spring or autumn so as to expose and kill the pupae. A spray of ½ lb. pyrethrum powder and 2½ lb. sugar in 10 gals. water is recommended against the adults.

[POLIZU (S.).] **Полизо (С.). Supplementary Data on the Vine Mite.**
[In Russian.]—*Bul. agric. Bessarabia* no. 10–12, pp. 8–9.
Chişinău, December 1934. [Recd. March 1935.]

Observations on *Tetranychus telarius*, L. (*althaeae*, v. Hanst.) in Bessarabia were continued in the summer of 1934 [cf. *R.A.E.*, A 22 230], with special reference to food-plants, number of generations and control. In Bessarabia the mite occurs on 81 different plants, a list of which is given. Of these, *Althaea rosea* is preferred, but severe damage was caused to beans, beet, maize and vines, and infestation of sunflowers in conjunction with that by *Puccinia helianthi* decreased the yield of seeds by 40 per cent. and spoiled the quality of the crop. From May to the end of October there were 10 generations, each with a life-cycle of 18 days. Large numbers of the eggs were destroyed by the larvae of *Scolothrips longicornis*, Priesn.

In field experiments on the control of the mite on vines, very good results were obtained by thorough spraying with 1 per cent. lime-sulphur.

[ПОПОВ (V. I.).] **Попов (В. И.). Observations on the Corn Earworm**
[*Heliothis obsoleta* Fab. (*H. armigera* Hübn.)] in Obrastzov-
tchiflik. (Preliminary Report.) [In Bulgarian.]—*Z. landw.*
VersSta. Bulg. 6 no. 3–4 pp. 53–75, 14 figs., 19 refs. Sofia,
1934. (With a Summary in English.)

Heliothis obsoleta, F., caused considerable damage to maize in north-eastern Bulgaria during 1931–33, when field observations on its bionomics were carried out near Rustchuk. Examination in September 1931 of a variety sown in mid-June showed an infestation of 72.19 per cent. of the plants and of 60.42 per cent. of the cobs. In 1933, the damaged cobs were attacked by fungi. The egg-stage lasted 5–6 days in June and the larval 16–25. Pupation usually takes place in the soil, but in 1933 some of the larvae pupated in their tunnels inside the maize cobs. The adult females lived about 12 days and laid from 400 to 3,000 eggs, with an average of 1,000 [cf. *R.A.E.*, A 17 3]. In 1931, 69 per cent. of the larvae infesting maize cobs in the experiment field were killed by bacterial diseases and 2.37 per cent. by the Braconid, *Microbracon brevicornis*, Wesm., brief notes on the biology of which are given. In 1933, cold weather and sharp fluctuations of temperature in August caused a high mortality among the larvae. To safeguard maize from infestation in north-eastern Bulgaria, it should be sown in the second half of April or in May. Varieties with long, thick and close-fitting husks are much less severely damaged [cf. 19 690].

PUSSARD (R.). **Observations sur la biologie du *Capnodis tenebrionis* L. et sur les méthodes de lutte contre cet insecte (Col. Buprestidae).**—*Bull. Soc. entom. Fr.* 40 no. 2 pp. 23–26, 1 ref. Paris, 1935.

Most of the information given in this paper on the bionomics and control of *Capnodis tenebrionis*, L., on stone-fruit trees in France has already been noticed [*R.A.E.*, A 23 141, etc.]. Additional observations have shown that the eggs present in the ovaries of newly emerged females are immature, but after a certain period of feeding the number of fully developed eggs rises to 60–100. Pairing was seen to occur mainly on the trunk and branches, and the greatest number of eggs was laid

during July–August. In the orchards of Alpes Maritimes and Var, the ant, *Pheidole pallidula*, Nyl., was occasionally seen to destroy the eggs and pupae.

BUA (G.). *Seconda serie di esperimenti con sostanze attrattive per la mosca delle frutta* *Ceratitis capitata* Wied. [A second Series of Experiments with Substances attractive to the Fruit-fly, *C. capitata*.]—*Boll. Lab. Zool. Portici* **28** pp. 295–308. Portici, 30th January 1935.

Continuing previous work on baits for *Ceratitis capitata*, Wied. [*R.A.E.*, A **22** 273] experiments, here described in detail, were made from May to October 1934 in Salerno and in November in Sicily. In Salerno a considerable reduction in the numbers of flies was obtained with baits containing borax in addition to bran water or water in which dried figs had been soaked. To prepare the former, 10 lb. bran and 10 lb. borax were stirred into 4 gals. water, allowed to stand for 15 hours, stirred again and then allowed to stand until the solid particles had settled, when the supernatant liquid was decanted and diluted with water to a total of 20 gals. This solution keeps well in closed containers. The borax was added to water in which dried figs [*loc. cit.*] were soaked at the rate of $\frac{1}{2}$ lb. to $\frac{1}{2}$ lb. figs in 1 gal. water. It interfered very little with the attractive power of the baits, but it prevented them from fermenting, and so made them last longer.

In Sicily, a bait prepared from the fruit of *Arbutus unedo* was far superior to any of the other baits against both *C. capitata* and *Dacus oleae*, Gmel. The ripe fruits were rubbed through a sieve on 29th October and well pressed. After 2 days fermentation was accelerated by adding 2 gals. hot water per 100 lb. mashed fruit. Early in November, when rapid fermentation was over, the mass was strained and the liquid put into jars, where slow fermentation continued during November. The liquid was diluted at the rate of 10 or 40 per cent. with water, the higher concentration being more effective, and used between 10th November and 3rd December.

PAOLI (G.). *Ancora sulla Triefora delle campagne del Gabbro.* A further Note on the *Tomaspis* of the Gabbro Countryside.]—*Pagine agric.* 1935 no. 1 reprint 7 pp., 2 figs. Leghorn, January 1935.

The Cercopid, *Tomaspis* (*Triecphora*) *sanguinolenta*, Scop., which in 1933 and previous years was very abundant on vines, etc., near Leghorn [*R.A.E.*, A **22** 228], has suddenly vanished. Its disappearance has been attributed to climatic conditions. An account is given of the manner in which it produces froth-masses.

CAESAR (L.). *European Corn Borer Situation in Ontario in 1933.*—*Rep. ent. Soc. Ont.* 1933 **64** pp. 9–12. Toronto, 1934.

As compared with 1932 [*cf. R.A.E.*, A **22** 303], infestation of maize by the corn borer [*Pyrausta nubilalis*, Hb.] increased in some counties in Ontario and decreased in others, but in general changed little. From 1926 or 1927 infestation decreased rapidly until 1930; in 1931 and 1932 it increased slowly, in most counties, but was very much lower than in 1926 and 1927.

In view of an agitation by farmers against the Corn Borer Act [17 394] and the need for strict economy, five counties wishing to dispense with the Act were allowed to do so.

STIRRETT (G. M.), BEALL (G.) & LINDSAY (E.). **Some Characteristics of the Flight and Oviposition Habits of the European Corn Borer, *Pyrausta nubilalis*, Hübner.**—*Rep. ent. Soc. Ont. 1933* 64 pp. 12–21, 5 figs., 1 ref. Toronto, 1934.

Information, illustrated by tables and graphs, is given on the activities of adults of *Pyrausta nubilalis*, Hb., observed on experimental plots of maize and caught in a light-trap in Ontario during 1927–33, with particular reference to 1932–33 [*cf. R.A.E., A* 19 30]. The flight period has begun, and in general reached its peak, increasingly early during the last few years. If this tendency continues, it will be possible to plant maize late enough to escape infestation and yet early enough to ensure its maturing before the frosts. The peaks of flight and oviposition occur about the same time.

HALL (J. A.). **Apple Leaf Rollers in Ontario.**—*Rep. ent. Soc. Ont. 1933* 64 pp. 21–31, 3 refs. Toronto, 1934.

The biology, distribution and economic importance of leaf-rollers attacking apple are set out in notes and tables based on investigations in Ontario during 1929–33. A key to the mature larvae is appended. Of the Tortricids, *Tortrix (Archips) argyrospila*, Wlk., is by far the most prevalent. Four outbreaks of *T. (A.) semiferana*, Wlk., were observed; *T. (A.) rosaceana*, Harr., usually causes a small amount of injury to the fruit each year; *T. (Pandemis) limitata*, Rob., comprised 10–31 per cent. of the population from some orchards; *T. (A.) fractivittana*, Clem., was of minor importance; and *T. (A.) purpurana*, Clem., *Eulia quadrifasciana*, Fern., and *Amorbia humerosana*, Clem., were taken in small numbers and only in the experimental orchard. *E. velutinana*, Wlk., and the Gelechiid, *Dichomeris ligulella*, Hb., have been previously dealt with [*R.A.E., A* 19 752].

In spring, the larvae, in general, feed and construct webs in the buds, roll the leaves, eat the floral structures and attack the developing fruit, causing scars and open cavities and distorting its shape. In summer, they skeletonise the leaves and eat small holes in the fruit. *T. argyrospila* and *T. semiferana* were most injurious in orchards containing trees with dense wood growth and situated at some distance from the Great Lakes. Near the Lakes evening temperatures are lower and consequently fewer eggs are laid. Populations were greatly reduced during 1931 and 1932, as the result of the two previous hot, dry seasons, and were slightly larger in 1933, as more eggs were laid during the less extreme season of 1932. Weeds may be an important factor as they afford shelter for the pupae, though they do not serve as alternative food-plants. The percentage of winter mortality is connected with the stage in which the insects overwinter and the time at which they go into hibernation. Species that overwinter as pupae or adults are seldom serious pests, and those that go into hibernation in July suffer a heavier winter mortality than those that begin to hibernate in September. The eggs of *T. argyrospila* and *T. semiferana* hatch in May, and the overwintered larvae or the adults of the other species appear in the same month. Larval activity and development may vary considerably in the same season. The pupal period lasted 8–23 days with an

average of 11-19. The adults were only active at 60°F. or higher. Of the species bred in the insectary, all had one generation a year, except *T. rosaceana*, which produced a partial second generation, and *E. velutinana*, which gave rise to a large second generation and a partial third.

WORTHLEY (L. H.). **Quarantine and Control Operations for the Japanese Beetle in the United States.**—*Rep. ent. Soc. Ont. 1933* **64** pp. 32-36. Toronto, 1934.

An account is given of the occurrence of the Japanese beetle [*Popillia japonica*, Newm.] in the United States and of the successful control of isolated infestations such as might develop on its accidental introduction into Canada. There are a number of such infestations within a comparatively short distance from Ontario, though the main centre is about 275 miles south of the border. No extensive increase in distribution occurred in 1933. The fact that south-western Ontario is situated on the same latitude as the most northern island of Japan, where the insect is quite generally distributed, indicates that it is capable of developing in areas further north than those it has now reached in the United States. In 1933, for the first time, enormous numbers of beetles were observed floating on the Delaware River and in the Bay and along the Atlantic coast of Staten Island and Long Island. About 100 miles of coast line were involved. Sometimes 25 per cent. of the beetles could crawl after being washed ashore. Live beetles floated from New Jersey to Delaware and established a comparatively heavy infestation on the coast. The author considers that measures should therefore be taken to prevent *Popillia* from becoming established in Canada.

ROSS (W. A.) & PUTMAN (W.). **The economic Insect Fauna of Niagara Peach Orchards.**—*Rep. ent. Soc. Ont. 1933* **64** pp. 36-41, 2 refs. Toronto, 1934.

Brief notes, based on the authors' observations, are given on insects and mites that are actual or potential pests in peach orchards in the Niagara fruit belt. The more important predators are also mentioned.

MCLAINE (L. S.). **The Relation of Entomology to the Dutch Elm Disease.**—*Rep. ent. Soc. Ont. 1933* **64** pp. 41-43, 3 refs. Toronto, 1934.

The history of Dutch elm disease [caused by *Ceratostomella ulmi*] in the United States is reviewed [cf. *R.A.E.*, A **22** 34, 652, etc.], and its symptoms are described. Trees 15-20 years old lose their healthy appearance within 3 days and the leaves fall in a week, whereas trees of 60-80 years of age die much more slowly. All European and American varieties of the elm, particularly the white or American elm (*Ulmus americana*), are susceptible to the disease. The Chinese or Siberian elm (*U. pumila*) is very resistant and is believed by some to be immune.

Of insects transmitting the disease [cf. **22** 393, 652], *Scolytus multistriatus*, Marsh., which has been established in the United States since 1909, was first thought to be a primary pest of elms, but is now known to attack only weakened trees or portions of trees. According to Dr. J. M. Swaine, *S. multistriatus* is not known to occur in Canada, but

steps have been taken to prevent the introduction of the disease. The importation of elms from Europe was prohibited in 1928, and in 1928-29 elms imported into Canada since 1923 were reinspected.

THOMPSON (R. W.). A preliminary Report of the Control of Tarnished Plant Bug, *Lygus pratensis* L. in Celery.—*Rep. ent. Soc. Ont. 1933* 64 pp. 43-47, 1 fig. Toronto, 1934.

In 1929 a local outbreak of *Lygus pratensis*, L., resulting in a loss of half the early crop of celery, occurred in Ontario. The whole heart may be injured by feeding and oviposition punctures, and the plants may become a total loss. The reason for the confinement of the infestation to the early crop is not known, but the insect may come from neighbouring crops, such as early cauliflowers and cucumbers, that have been harvested previously. Weeds and piles of rubbish near celery provide winter quarters and food-plants for the bugs in spring.

A survey of the control methods used by the growers was made in 1929. A 3 per cent. nicotine dust and sprays of nicotine sulphate (1 : 800) or Bordeaux mixture were unsatisfactory. In control experiments neither nicotine, at varying strengths, nor derris, both used as dusts and sprays, were effective against any stage. Naphthalene flakes, which had seemed to be of some value as a repellent against the bugs in cages, were useless in the field. No experiments were carried out in 1930 and 1931 as the insect caused no damage. Since dusts of sulphur and sprays of sulphur and hydrated lime [*R.A.E.*, A 20 524] had successfully prevented injury in New York, various sulphur compounds were tested in 1932, but the celery was harvested before the injury caused by the bugs became conspicuous. In a further experiment a proprietary fungicide (Koloform) containing 56 per cent. sulphur and 44 per cent. inert matter was applied with a power sprayer. One application reduced the damage in the treated plot to one-third of that in the control. In 1933, when the same fungicide, at the rate of 200 lb. per acre, was applied as a dust on 12th July and again about a week later, none of the treated celery was lost, whereas the control plot was too badly damaged to be worth lifting. Irrigation was continued after the dustings, and although a conspicuous sulphur residue remained in the hearts, it was easily removed in the rinsing. In this part of Ontario it has only been necessary to protect the early celery, which is harvested in August.

HAMMOND (G. H.). Ploughing and Discing Experiments for the Control of White Grubs in eastern Canada.—*Rep. ent. Soc. Ont. 1933* 64 pp. 47-52. Toronto, 1934.

An account is given of experiments carried out in eastern Canada in 1933 to find the value of ploughing and disking as a control for white grubs [*Lachnosterna*]. When grass fields were ploughed with horses and then disked three times, ploughing to depths of 2.44, 3.47, 4.77 and 6.11 ins. reduced the number of grubs by 80, 64.5, 70.5, and 60.2 per cent., respectively. One ploughing and 4 diskings, using tractor-drawn equipment, gave a reduction of 94.9 per cent., or an average grub population of 3 per sq. yd. The corresponding figures, when horses were used, were 88.7 and 6. This would render the soil safe for most farm crops, except maize, potatoes and strawberries. A fifth disking would make it safe to plant all crops. Two diskings in a muck soil,

where the sod had been previously destroyed by grubs, reduced the infestation by 37.7 per cent. and were nearly as effective as one ploughing to a depth of 4.5 ins.

Crop rotation is the best means of control, and the plough and disk should only be used for land that has nevertheless become badly infested. In pastures or meadows, where the grubs are likely to be most numerous, 5 diskings after one shallow ploughing would be necessary to make the field safe for all crops. Extra diskings should be given if the grub population is above 5 per sq. yd. In land such as grain stubble, 3 or 4 diskings would probably be sufficient. Ploughing and disking should be done between early May and late September, when the grubs are fairly near the surface.

MITCHENER (A. V.). **The Grasshopper Campaign in Manitoba in 1933.**—*Rep. ent. Soc. Ont. 1933* 64 pp. 52–55, 1 map. Toronto, 1934.

In 1933, a severe outbreak of grasshoppers [*Camnula pellucida*, Scudd., *Melanoplus bivittatus*, Say, and *M. mexicanus*, Sauss.] in Manitoba was effectively controlled by a poison bait of 50 lb. bran or malt sprouts, an equal volume of sawdust, 1 qt. liquid sodium arsenite (containing 2 lb. As_2O_3) and 10–12 gals. water. The greater concentration of the sodium arsenite solution as compared with that used in 1932 [R.A.E., A 22 303] halved the cost of handling it and did not affect the preparation or use of the bait. The omission of salt did not appear to affect its attractiveness. Preliminary experiments in 1933 indicated that grasshoppers neither eat the sawdust in the bait nor suck the moisture from it. Lead fluosilicate, and sodium fluosilicate to a less extent, were also effective poisons.

The first bait was used on 19th May. Poisoning was general from 2nd to 24th June and had practically ceased by 24th July. More use should be made of cultural practices that hinder oviposition and destroy the eggs.

The amounts of bait used in 1933 and the approximate costs (about £20,000) are given, and it is estimated that the crops saved included $16\frac{1}{2}$ million bushels of wheat, oats and barley.

DE GRUYSE (J. J.). **Note on a new Light Trap.**—*Rep. ent. Soc. Ont. 1933* 64 pp. 55–57, 1 fig. Toronto, 1934.

A diagram and description of a new light-trap for Lepidoptera are given. A large, galvanised iron funnel fits into a neck in the lid of a bucket-shaped, copper receptacle. The height of the funnel is 24 ins. and its diameter 24 ins. at the mouth and $4\frac{1}{2}$ at the neck. The receptacle is 14 ins. high and measures 10 ins. across at the top and 7–8 at the bottom. Two vertical glass plates are fitted on opposite sides of the mouth of the funnel to catch insects circling round the light. An ordinary electric bulb, a daylight bulb or a good lantern is suspended between the glass plates nearly on a level with the funnel's rim. A set of four movable trays, fitting closely one into the other and pierced with circular openings of a gradually decreasing diameter ($\frac{5}{8}$ – $\frac{1}{8}$ in.) are mounted inside the receptacle. The lowest tray is made of a fine copper screen. These trays separate the insects according to size and prevent crowding and mutilation. A layer of cotton-wool saturated in carbon tetrachloride is placed underneath the lowest tray. A small tin filled with cotton-wool soaked in carbon tetrachloride and covered

with a perforated lid is placed on each tray. The carbon tetrachloride should be renewed every night, and $\frac{3}{4}$ gal. should suffice for one season. The insects are stupefied almost at once and need to be relaxed before they can be pinned.

BALCH (R. E.), SIMPSON (L. J.) & PREBBLE (M. L.). **The European Spruce Sawfly Outbreak in the Gaspé Peninsula.**—*Rep. ent. Soc. Ont.* 1933 **64** pp. 57–59. Toronto, 1934.

The distribution of *Diprion polytomus*, Htg., on spruce, since it was first observed in the Gaspé Peninsula, Quebec in 1930 [*R.A.E.*, A **20** 590] has greatly increased [*cf.* **22** 496]. The attack was not so severe in 1932, as less than 30 per cent. of the larvae in the ground gave rise to adults because of the short, cold season. The 1933 season was unusually dry, and during the period of greatest adult emergence the temperature was high, with the result that the percentage of emergence was twice as great as in the previous year. Larvae that had remained in the cocoons for 3 winters pupated and emerged in large numbers. Most of the trees that died had also been attacked by the bark-beetle, *Dendroctonus piceaperda*, Hopk. In one area in Quebec 40 per cent. of the white spruce [*Picea glauca*] and 24 per cent. of the black spruce [*P. mariana*] have already died. The number of overwintering sawfly larvae greatly increased in 1933. Samples of soil taken from beneath defoliated trees had an average population per sq. ft. of 17 cocoons containing larvae, 8 from which adults had emerged and 15 destroyed by natural enemies [*cf.* **20** 591]. Temperature appears to influence the percentage and time of emergence of the adults. The new areas of infestation discovered appear to have been infested for 2 or 3 years. Except in heavily infested districts the sawfly has increased locally rather than spread to other areas. In some localities it usually has only one generation a year, but in Southern New Brunswick, where it is present in small numbers, it has two, as in Europe.

There seems to be little doubt that the sawfly is the European species, but there are differences that might be considered racial. The adults from Gaspé are slightly larger than the European ones. In Europe the cocoons are formed in the tree, but in Canada they are spun in the ground. Males are more numerous in Europe than in Canada, where only four have been found amongst the thousands of sawflies examined.

TWINN (C. R.). **A Summary of Insect Conditions in Canada in 1933.**—*Rep. ent. Soc. Ont.* 1933 **64** pp. 62–80. Toronto, 1934.

An account is given of the occurrence in Canada in 1933 of numerous insect pests on field and garden crops and fruit, forest and shade trees, and in stored products and houses.

Service and Regulatory Announcements July–September 1934.—*U.S. Dep. Agric. S.R.A. B.E.P.Q.* no. 120 pp. 59–91. Washington, D.C., January 1935.

Recent revisions and amendments to existing quarantine Orders of the United States, which are given verbatim, include two announcements relating to the Fruit and Vegetable Quarantine no. 56 (B.P.Q. no. 362, Supplements nos. 1 & 2 of 26th July and 2nd August 1934), by which the entry into the United States of grapes subject to sterilisation by refrigeration from regions where the Mediterranean fruit-fly

Ceratitis capitata, Wied.] is known to occur, is limited for the present shipping season to the period 1st October–15th April, when the availability of susceptible fruits and temperature conditions are such as not to offer risk of the development of the fly should it escape from broken containers. The only type of container approved for shipment of grapes is a tight barrel or keg. Breakage conditions will be observed and future shipping seasons will be restricted or not according to the conditions found to obtain. Plant Quarantine Restrictions issued by Greece, Jamaica, Peru, Cuba, Mexico, Germany and Czechoslovakia are quoted or summarised.

Modification of Nursery Stock, Plant and Seed Quarantine Regulations.

Amendment no. 2 of Revised Rules and Regulations supplemental to Notice of Quarantine no. 37.—U.S. Dep. Agric. B.E.P.Q. Q. 37, 4 pp. multigraph. Washington, D.C., 14th January 1935.

A revision of the third of the Regulations supplementary to Quarantine No. 37 already noticed [*R.A.E.*, A **15** 390, etc.] permits the entry, under permit and subject to inspection, of narcissus bulbs on and after 15th December 1936, without limitation as to quantity or use, from countries that maintain inspection. Provision is made in Regulation 7 for the use of soil, if sterilised or otherwise safeguarded, as packing for nuts and seeds as well as for bulbs or corms.

Notice of Lifting Quarantine No. 62—Narcissus Bulb Quarantine.—

U.S. Dep. Agric. B.E.P.Q. Lifting Q. 62, 1 p. multigraph. Washington, D.C., 14th January 1935.

Legislation restricting the interstate movement of bulbs of the genus *Narcissus* in the United States [*R.A.E.*, A **14** 492; **16** 561; **17** 163; etc.] is revoked as from 1st April 1935.

Division of Entomology.—*Rep. N.Y. St. agric. Exp. Sta.* **53** (1933–34) pp. 42–52. Geneva, N.Y., 1935.

Some of the work carried out against injurious insects in New York State during the year ending 30th June 1934 has already been noticed [*R.A.E.*, A **22** 300, 401, 408; **23** 176]. The oriental fruit moth [*Cydia molesta*, Busck] was even less abundant in peaches in 1933 than in 1932, the population in Niagara County being 4,451 per acre [*cf.* **22** 178], and temperatures below zero early in 1934 killed about three-quarters of the hibernating larvae in this and another county. In 1933, *Macrocentrus ancylivorus*, Rohw., destroyed 27.5 per cent. of the twig-infesting larvae in Niagara County and seems to be increasing in three other counties. Mercurous chloride (calomel) and the oxides of mercury, mixed with an inert carrier such as gypsum, talc or hydrated lime, may be safely and effectively used against root maggots [*Phorbia brassicae*, Bch.] on seedlings and cabbages in the field. A 4 per cent. dust appears to be most satisfactory and 2 or 3 light applications should give good control. Cherries may be protected from the cherry fruit-fly [*Rhagoletis cingulata*, Lw.] by sprays containing powdered derris root combined with an adhesive such as gum arabic. Such a spray might take the place of arsenicals, at least in the later applications on fruit to be used fresh. Sprays containing not more than 3 per cent. tar oil did not harm apple trees only slightly affected by the severe winter,

but they injured or reduced the set of fruit on those that had been severely weakened. Higher concentrations appeared to cause damage to trees even moderately affected by the winter. A spray containing 2 per cent. tar oil reduced the set of fruit on sweet cherries exposed to -20°F . Petroleum oil applied in autumn was more injurious to apples than tar oil at the same concentration.

Anuraphis roseus, Baker, was very harmful to apples in the Hudson Valley in 1933, though good control was obtained in some cases by the application of nicotine sulphate or tar distillate at the delayed-dormant and dormant periods, respectively. Nicotine, applied later than the strictly delayed-dormant stage, was generally ineffective. Tests indicated that *Nodonota puncticollis*, Say, which is sometimes a serious local pest of apples and pears, may be controlled by arsenicals [cf. 22 406] applied on about 1st and 13th June. *Agrilus sinuatus*, Ol., *Chrysobothris femorata*, F., and *Scolytus rugulosus*, Ratz., were rather abundant on pears, and the leaf-curling midge [*Dasyneura pyri*, Bch. (cf. 20 530)] was more numerous in 1934 than 1933. The two-brooded form of the European corn borer [*Pyrausta nubilalis*, Hb.] caused considerable damage to maize and vegetables, particularly lima beans, in one county on Long Island, and it is spreading westwards. The autumn crop of cauliflowers was adequately protected against cabbage worms [*Pieris*] by applying derris dusts containing not less than 0.5 per cent. rotenone every 14 days during the infestation. Talc, Georgia clay and tobacco dust were the most satisfactory diluents. Rotenone sprays were less effective.

Tetranychus telarius, L., on raspberries is most effectively controlled by summer sprays of lubricating oil (1 : 100), with a viscosity of about 100 secs. and an unsulphonated residue of 60–70 per cent. Summer oil emulsion with a higher unsulphonated residue and a somewhat lower viscosity is also satisfactory. Nicotine (1 : 800) with soap gave good results but was apparently less effective against the eggs. According to experimental evidence lime-sulphur, oil, or nicotine sulphate against *Chermes abietis*, L., on spruce is less valuable if it is applied in late spring than if it is used before the overwintering females reach maturity. Lime-sulphur (1 : 11) was better than a 1 per cent. oil emulsion or nicotine (1 : 800) with soap. The larvae of *Otiorrhynchus* (*Brachyrrhinus*) *ovatus*, L., damaged the roots of hemlock [*Tsuga*], and the adults injured the leaves and buds of spruce seedlings and the foliage and branches of arborvitae [*Thuja occidentalis*]. The larvae of *O. (B.) sulcatus*, F., caused particular damage to the root hairs and larger roots of *Taxus*, but also attacked *Thuja*. Poison bait placed round the trees has shown promise against the adults of both species, and the use of arsenicals on the foliage has reduced the damage by *O. ovatus*.

ADAMS (J. A.). **The early Instars of the Firebrat *Thermobia domestica* (Packard) (Thysanura).**—*Proc. Iowa Acad. Sci.* 40 pp. 217–219, 1 graph. Des Moines, 1933. [Recd. March 1935.]

Thermobia domestica, Pack., has continued to breed throughout the year at Iowa State College at a constant temperature of 37°C . [98.6°F .]. Eggs laid in cotton batting hatched in about 15 days, and the complete life-cycle from egg to egg took about 11 weeks. Sexual maturity was attained after numerous moults, but well before the insects reached maximum weight. A graph and tables show the dimensions of various parts of the insects during the first four instars.

HENDRICKSON (G. O.). **The Effect of heavy Rains on the Orthoptera (Grasshopper) Population of the Prairie.**—*Proc. Iowa Acad. Sci.* 40 pp. 238–239. Des Moines, 1933. [Recd. March 1935.]

Field observations during August 1932 suggest that the decrease of about 30 per cent. in the grasshopper population in the prairies of Iowa was mainly due to heavy rains (5.95 in. during 10 days).

WILSON (J. W.). **The Asparagus Caterpillar : Its Life History and Control.**—*Bull. Florida agric. Exp. Sta.* no. 271, 26 pp., 5 figs., 11 refs. Gainesville, Fla, September 1934. [Recd. February 1935.]

Further studies [cf. *R.A.E.*, A 21 80] during 1932–33 on *Laphygma exigua*, Hb., which attacks asparagus fern (*Asparagus plumosus* var. *nanus*) in Florida, showed that the length of the stages is greatly influenced by temperature. The Noctuid is found in all stages during every month of the year, but is scarce from December to March, when it breeds more slowly than in summer. During May to November the average number of eggs laid by a female was about 600. Most of the eggs were laid during the first 3 days. The largest number laid by one female was 1,321. The eggs in 27 masses laid between 3rd and 5th November 1933 failed to hatch; from 3rd to 15th November the average temperature was 66.7°F., with a minimum of 43°F. for 3 days, and below 50°F. for 10. Larvae, however, were observed in an asparagus fernery near the laboratory early in December. During the summer each of the 5 larval instars requires about 2 days. From June to September, when average temperatures ranged from 78.1 to 80.9°F., the larval stage was completed in some instances in less than 10 days, with an average of 11.5–13.2. During November, with an average temperature of 61.5°F., the larval stage averaged 37.6 days. Larvae hatched from the same egg-mass remain together for a few hours, feeding on adjacent foliage, before dispersing to different parts of the plant. The pupal stage in the soil lasts 6–8 days when the average temperature is 78–81°F., but is much longer at lower temperatures. Rather more females than males complete the pupal stage. From 1st May to 20th September 1933, 6 complete generations were reared. As after 1st June the generations overlap, all stages being continuously present, no definite time can be specified for applying control measures, but the proper time is as soon as possible after the eggs hatch. With favourable weather conditions, almost complete control of the larvae has been obtained within 8 hours of applying insecticides to young asparagus foliage when the larvae were a few hours old.

On asparagus ferns, dusts are more practical and economical than sprays. In tests of a number of insecticides, the results of some of which are tabulated, only undiluted lead arsenate dust gave adequate control without causing injury to the plants. It should be applied in the morning when there is some dew on the plants and little or no wind. Notes are given on the natural enemies of *L. exigua* [cf. 21 290]. A lizard, *Cnemidophorus sexlineatus*, and a toad, *Bufo quercicus*, were abundant in the asparagus beds, and an unidentified bacterium destroyed many of the larvae in rearing cages in the insectary throughout the summer months and made it difficult to rear them in September and October. A few larvae that had apparently been killed by it were found in the ferneries.

CROSBY (C. R.) & MILLS (W. D.). **Protecting Orchard Crops from Diseases and Insects in the Hudson Valley.**—*Cornell Ext. Bull.* no. 314, 89 pp., 16 figs. Ithaca, N.Y., N.Y. St. Coll. Agric. January 1935.

This bulletin is similar to one previously noticed [*R.A.E.*, A **22** 300]. It contains new information on the green fruit-worms, *Graptolitha* (*Xylina*) *grolei*, Riley, *G. (X.) antennata*, Wlk., *G. (X.) laticinerea*, Grote, and *Monima hibisci*, Guen. (*insciens*, Wlk.), chiefly on apple and pear and *Agrilus sinuatus*, Ol., on pear [cf. **23** 101], all of which were unusually abundant in 1933. It omits any reference to quince.

TUCKER (R. W. E.). **A further Contribution to the Analysis of Field Data on *Diatraea saccharalis* in Barbados.**—*Agric. J. Barbados* **3** no. 4 pp. 26-32, 2 refs. Barbados, October 1934. [Recd. March 1935.]

The analysis of the complete field data for 1934 on the mortality factors influencing *Diatraea saccharalis*, F., on sugar-cane in Barbados has made it possible to calculate mathematically the total real mortalities [cf. *R.A.E.*, A **22** 538] in places where the egg parasite, *Trichogramma minutum*, Riley, is or is not colonised. A comparison of the monthly real mortality and the initial *Diatraea* population, i.e., the number of eggs per acre per month, showed that far more larvae survived where the egg parasite was not colonised. By correlating these figures with the number of cane shoots per acre, the extent of the damage was theoretically estimated. It thus appeared that from May to September the damage in colonised areas should have varied from about 15 to 45 per cent. of the damage in places where *Trichogramma* had not been colonised. According to this theoretical estimate, 5.55 per cent. of the shoots would have been damaged by the borer during February-April in fields where the parasite was colonised. The actual field count, including an allowance of one-fifth for damage already done but not yet apparent, was 4.64 per cent., and the author believes that the disparity is partly due to field errors.

GÉRARD (G.). **Come si combatte la " Broca " del caffè in S. Paolo del Brasile.** [How the Coffee Borer is combated in S. Paulo, Brazil.]—*Agricoltura colon.* **29** no. 2 pp. 96-98. Florence, February 1935.

This is a brief account of the history of the coffee berry borer, *Stephanoderes hampei*, Ferr., in São Paulo, of the establishment of a commission for combating it, and of the various measures taken [cf. *R.A.E.*, A **15** 30, etc.], including the successful introduction from Uganda of the Bethyloid parasite, *Prorops nasuta*, Wtstn. [cf. **22** 186].

VAN DER MEER MOHR (J. C.). **Plagen der tabak.** [Pests of Tobacco.]—*Meded. Deli Proefst.* (2) no. 91 pp. 12-24. Medan, 1935.

Notes are given on the incidence in 1934 of a number of pests attacking tobacco in Deli, Sumatra; the species involved have already been noticed from previous reports [*R.A.E.*, A **21** 274, 361]. Some damage was caused by the larvae and adults of Elaterid beetles.

ADRIANO (F. T.), OLIVEROS (S. B.), TABIJE (D.) & CRISOSTOMO (F.). **A Preliminary Study on the Rotenone Content of some Derris Roots collected from different Parts of the Philippines.**—*Philipp. J. Agric.* **5** no. 4 pp. 245–254, 11 refs. Manila, 1934.

Of 21 samples of derris root obtained from different parts of the Philippines and extracted with ether, 5 contained 0.59–2.42 per cent. rotenone, 8 contained 0.10–0.42, and the remainder 0.09 or less. Most of the high yielding samples came from the southern part of the Islands. Of roots of various sizes, the smaller ones, about 1 cm. in diameter, contained more rotenone. A ton of roots with a rotenone content of 2.42 per cent. yields only about 53 lb. rotenone crystals, and one acre yields less than 5 cwt. dried derris roots.

SONAN (J.). **On three new Species of Moths in Japan and Formosa.**—*Kontyû* **8** no. 4–6 pp. 212–214, 3 figs. Tokyo, December 1934.

Descriptions are given of the females of the Geometrid, *Boarmia unmon*, sp. n., and the Arctiid, *Pericallia takanoi*, sp. n., and of the male of the Lasiocampid, *Dendrolimus okinawanus*, sp. n. *B. unmon*, which has three generations a year, attacks tea in Japan and is occasionally a serious pest; *P. takanoi* feeds on *Aeginetia indica*, a plant that causes much injury to sugar-cane in Formosa; and *D. okinawanus* destroys pine needles in Okinawa (Loochoo Islands).

TAKAHASHI (R.). **Notes on the Aleyrodidae of Japan (Homoptera), I.**—*Kontyû* **8** no. 4–6 pp. 223–224, 1 fig. Tokyo, December 1934.

The Aleurodid, *Dialeurodes styraci*, sp. n., is described from pupal cases on the branches of *Styrax* sp. in Japan.

BUNTING (B.), GEORGI (C. D. V.) & MILSUM (J. N.). **The Oil Palm in Malaya.**—*Malayan Planting Manual* no. 1, Demy 8vo, [4] ix, 293 x-xx pp., 36 pls., 2 graphs, 4 plans. Kuala Lumpur, Dep. Agric. S.S. & F.M.S., 1934. [Recd. April 1935.]

This is a general work of reference for planters and others connected with the cultivation of the oil palm (*Elaeis guineënsis*) in Malaya and the handling of the crop. Part of a chapter (pp. 71–80), by G. H. Corbett, includes brief notes on the bionomics and control of injurious insects. This palm is comparatively free from insect infestation.

SQUIBBS (F. L.). **Work connected with Insect Pests and Fungus Diseases.**—*Rep. Dep. Agric. Seychelles 1933* p. 5. Victoria, Seychelles, 1934.

The Indian strain of *Cephalosporium lecanii* received from the Imperial Mycological Institute [*R.A.E.*, A **22** 14] for the control of scale insects on coconut in the Seychelles proved to be effective in experiments in which several plants infested chiefly with Lecaniine scales were potted and covered with a solution containing the spores from the tubes in which the fungus had been sent. The fungus did not appear to attack Diaspine scales on the leaves and stems of the treated plants, but became well established on the Lecaniine scales, especially *Coccus* (*Lecanium*) *viridis*, Green, on coffee. It seems to have spread successfully over a wide area.

An insect defoliating *Indigofera endecaphylla* and pigeon peas (*Cajanus indicus*) was identified as *Dichomeris ianthes*, Meyr., and a beetle boring through the shell of a nut of coco-de-mer [*Lodoicea callipyge*] as *Xyleborus perforans*, Woll.

Union of South Africa. Agricultural Pests Act 1911. Proclamation no. 265, 1933. Pretoria, 29th November 1933. [Recd. February 1935.]

In view of the danger of introducing certain insect pests, the importation into South Africa of apples, pears, quinces and loquats originating from Japan, Korea, China, Manchuria and East Siberia is prohibited as from 29th November 1933.

Union of South Africa. Agricultural Pests Act 1911. Proclamation no. 1627, 1933. Pretoria, 1st December 1933. [Recd. February 1935.]

The collection, distribution or removal by unauthorised persons of any stage of *Cactoblastis cactorum*, Berg, or any other insect that has been placed by authorised officers on any property for the purpose of controlling the recognised pest species of *Opuntia* (especially *O. maxima*, *O. megacantha* and *O. aurantiaca*) is forbidden.

THORPE (W. H.). **The Biology and Development of *Cryptochaetum grandicorne* (Diptera), an internal Parasite of *Guerinia serratulae* (Coccidae).**—*Quart. J. micr. Sci.* (N.S.) **77** no. 2 pp. 273–304, 30 figs., 16 refs. London, December 1934.

The object of this paper is to compare the structure and biology of the Agromyzid, *Cryptochaetum grandicorne*, Rond., a parasite of the Coccid, *Guerinia serratulae*, F., with those of *C. iceryae*, Williston [*R.A.E.*, A **19** 398].

The following is largely taken from the author's summary. *C. grandicorne* is the only species of the genus known to occur in Europe and is probably confined to the Mediterranean region. The egg is laid in the haemocoel of the host and hatches to form a short-lived "embryo-larva" at first atracheate and showing no trace of external segmentation. Mouth-parts are present although the fore-gut is closed. Food is presumably absorbed by diffusion from the blood of the host. In the second instar, the larva is tracheate but apneustic. Segmentation is complete. The fore-gut is open, but the hind-gut remains closed. The food consists of the blood and fat body of the host. In the third (final) instar, the larva devours the internal organs of the host indiscriminately and the hind-gut is open. The tracheal system is amphipneustic. A few days after the beginning of this instar the posterior spiracles pierce the skin of the host. The puparium is formed in the dead host. Though a large number of eggs may be placed in a single host, only one parasite reaches maturity. In southern Italy and southern France there is one generation a year, and the life-history of the parasite is closely correlated with that of the host. While *C. iceryae* behaves normally only in very large cages, *C. grandicorne* lives, pairs and oviposits in the ordinary "lamp-glass" cages. The highly specialised ovipositor of *C. grandicorne* and its larval instars are described in detail, and the latter are compared with those of *C. iceryae*.

MOUTIA (L. A.). **Notes sur les principaux insectes nuisibles à la canne à sucre.**—*Rev. agric. Maurice* no. 78 pp. 187–192. Port-Louis, Mauritius, 1934.

A short general survey is given of insects that attack sugar-cane, which are classified as white-grubs [*Lachnosterna*], borers, sucking insects, and miscellaneous pests, as well as of the measures employed for their control. A table shows the chief insect pests of sugar-cane throughout the world, together with their parasites and predators and the countries in which they occur.

MCGREGOR (E. A.). **A new Spinning Mite on Citrus at Yuma, Arizona.**—*Proc. ent. Soc. Wash.* **36** no. 8–9 pp. 256–259, 1 pl. Washington, D.C., 1935.

Both sexes of *Tetranychus yumensis*, sp. n., are described from *Citrus* in Arizona. The mite spins extensive webs on the lower surface of the leaves, which become blotchy and sometimes fall in severe infestations. Grapefruit and lemons are preferred to oranges. The mite is most abundant during March–April, but becomes scarce when the daily maximum temperatures reach 100°F. It was first observed about 1928 and has not been reported outside the Yuma Valley. Control may readily be obtained with sulphur flour.

EWING (H. E.) & SMITH (F. F.). **The European Tarsonemid Strawberry Mite identical with the American Cyclamen Mite.**—*Proc. Ent. Soc. Wash.* **36** no. 8–9 pp. 267–268. Washington, D.C. 1935.

The authors distinguished no significant differences between the characters of individuals of *Tarsonemus pallidus*, Banks (cyclamen mite) from the United States and *T. fragariae*, Zimm. (strawberry mite) from England, and found both species to agree with the original description of *fragariae*. The habits of the mites and the type of damage they cause to identical plants are similar. Owing to the failure to establish mites from strawberry on *Cyclamen*, it had been thought that the Tarsonemids infesting strawberry in Europe and California belonged to a single species distinct from *pallidus*. But in experiments undertaken under favourable conditions, mites from strawberry in California were established on *Cyclamen*, *Delphinium*, *Saintpaulia* and *Achyranthes*, and caused damage exactly similar to that of *pallidus*. Others from Washington State were also established on *Cyclamen*. It therefore appears that the two species are identical and that *fragariae* (1905) is a synonym of *pallidus* (1899).

DAVIS (A. C.). **Note upon Insects found in Mushroom Houses.**—*Proc. ent. Soc. Wash.* **36** no. 8–9 p. 269. Washington, D.C., 1935.

The following species are recorded as new or little known pests of mushrooms in the United States: the mite, *Pigmeophorus americanus*, Banks, attacking spawn in cultures; the Collembola, *Proisotoma minuta*, Tull., *P. simplex*, Fols., *Lepidocyrtus albicans*, Reut., *L. cyaneus*, Tull., and *L. cyaneus* var. *cinereus*, Fols., attacking spawn, *Sinella höfti*, Schäf., *Hypogastrura (Achorules) matura*, Fols., and *Xenylla welchi*, Fols., attacking mushrooms, *L. lanuginosus*, Gmel., attacking spawn and mushrooms, and *X. humicola*, Tull.; the beetles, *Nephanes*

sp. and possibly *Corticaria serrata*, Payk., feeding on spawn, and *Ptilium* sp., reared from spawn; and *Pyrallis farinalis*, L., reared through several generations from compost from mushroom houses. Beetles of the genus *Acrilus* were predacious on springtails and perhaps on mites, and the Staphylinid, *Atheta virginica*, Bernh., which was very common, attacked the larvae of the mushroom fly, *Sciara* sp., in the beds.

WEHRLE (L. P.). **Notes on *Pycnoderes quadrimaculatus* Guérin (Hemiptera, Miridae) in the Vicinity of Tucson, Arizona.**—*Bull. Brooklyn ent. Soc.* **30** no. 1 p. 27. Brooklyn, N.Y., February 1935.

The Capsid, *Pycnoderes quadrimaculatus*, Guér., was found on beans in November 1931, squash and pumpkin in August 1933, and beans in September and wild African watermelon (*Citrullus vulgaris*) in October 1934. It punctures the leaves and causes them to turn grey. Injury to the foliage of cultivated watermelon (another form of *C. vulgaris*) and muskmelon (*Cucumis melo*) was also observed in September 1934.

KELSHEIMER (E. G.). **Response of European Corn Borer Moths to colored Lights.**—*Ohio J. Sci.* **35** no. 1 pp. 17–28, 3 figs., 7 refs. Columbus, Ohio, January 1935.

An account is given of experiments in Ohio already briefly referred to [R.A.E., A **19** 433] on the reaction of adults of *Pyrausta nubilalis*, Hb., to lights of various colours. The apparatus and technique adopted are described. When the filters were arranged in the ascending or descending order of wave-length and the light transmitted through them was in all instances of uniform or comparable intensity, the moths responded in significantly greater numbers to the lights of short wave-length than to those of long wave-length; that is, the blue light of the series attracted more moths than the red light.

Entomology.—*Bull. Pennsylvania Dep. Agric.* **17** no. 7 (Gen. Bull. no. 526) pp. 26–30. Harrisburg, Pa, 1st December 1934. [Recd. March 1935.]

During 1932 and 1933 over 15 million examples of *Trichogramma* sp. were reared and liberated in Pennsylvania for the control of the Oriental fruit moth [*Cydia molesta*, Busck] on peach. Eggs of the bagworm [*Thyridopteryx ephemeraeformis*, Haw.] were much better than those of the grain moth [*Sitotroga cerealella*, Ol.] for rearing the parasites. The eggs were collected in early spring and kept in cold storage for summer work. Eleven other parasites of *C. molesta* were taken in collections in 1933, of which two native species, *Glypta rufiscutellaris*, Cress., and *Angitia* (*Diocetes*) *obliterata*, Cress., were the most abundant. *Macrocentrus ancylivorus*, Rohw., which had been liberated in 1932, was recovered in some counties, and further liberations were made in 1933.

An account is given of work against the Japanese beetle [*Popillia japonica*, Newm.] and the gipsy moth [*Porthetria dispar*, L.], which was first found in Pennsylvania in 1932. In 1933, there were no facilities for continuing the survey, begun in 1932, of the counties most heavily infested with the European corn borer [*Pyrausta nubilalis*, Hb.], but no increase in the population was apparent.

Of insects present in injurious numbers in 1933, the chinch bug [*Blissus leucopterus*, Say] caused damage to sweet maize and grasses.

Scolytus multistriatus, Marsh., was present on elms in several nurseries [cf. *R.A.E.*, A 22 314]. As dusting and burning for the control of *Rhagoletis mendax*, Curran (*pomonella* auct.) on blueberries is impracticable in Pennsylvania, where infestation is becoming important, the berries should be picked by 1st August and carefully graded. *Phthorimaea* (*Gnorimoschema*) *lycopersicella*, Busck, which was first recorded in Pennsylvania on greenhouse tomatos in 1931 [20 298], appeared again in September 1933. Half of the greenhouses in two counties were infested. In two houses the pest was apparently introduced with tomatos received from California.

BRADLEY (W. G.) & BURGESS (E. D.). **The Biology of *Cremastus flavo-orbitalis* (Cameron), an Ichneumonid Parasite of the European Corn Borer.**—*Tech. Bull. U.S. Dep. Agric.* no. 441, 15 pp., 2 pls., 8 figs., 12 refs. Washington, D.C., November 1934. [Recd. February 1935.]

Cremastus flavo-orbitalis, Cameron, an oriental Ichneumonid parasite of the larva of *Pyrausta nubilalis*, Hb., was first introduced into the United States against it in the winter of 1928–29. Recently imported stock has been released in Pennsylvania against *Cydia* (*Grapholitha*) *molesta*, Busck. In Hawaii it has a large number of hosts, and it is instrumental in controlling the coconut leaf-roller [*Nephantis serinopa*, Meyr.] and the sugar cane leaf-roller [*Nacoleia accepta*, Butl.]. The synonymy and host relationships of this parasite are discussed from the literature [*R.A.E.*, A 21 422, etc.], and all its stages are described.

The following is mainly taken from the author's summary: The egg of *C. flavo-orbitalis* is laid in the body of the larva of *Pyrausta* and floats freely within its walls. Although five eggs may be deposited, only one larva develops beyond the first instar. One day after the parasite moults to the third instar, the host larva spins a loose web and attaches itself to a convenient surface. The parasite emerges from the middle portion of the host during the latter's fifth instar, and immediately begins to spin its cocoon. The prepupal stage lasts 3 days and the pupal 7. The adults, which are positively phototropic and very active, feed on sweetened water, honey or glucose and live for up to 66 days. They do not pair readily in captivity. They oviposit readily in larvae of the fourth or early fifth instar, but do not ordinarily deposit eggs in free-crawling larvae. At Kobe in Japan C. A. Clark found that in the laboratory the life-cycle was about 26 days in July and August.

The parasites reach the United States in the winter as well-developed first-instar larvae with the overwintering larvae of *P. nubilalis*. Under natural conditions they emerge as adults during the first part of July in Massachusetts. Notes are given on the distribution of the parasite and on its liberation in the United States. It has been recovered in Massachusetts, Rhode Island and Ohio.

DARBY (H. H.) & KAPP (E. H.). **Studies on the Mexican Fruit Fly, *Anastrepha ludens* (Loew).**—*Tech. Bull. U.S. Dep. Agric.* no. 444, 20 pp., 13 figs., 9 refs. Washington, D.C., November 1934. [Recd. February 1935.]

In further studies [cf. *R.A.E.*, A 21 685] of *Anastrepha ludens*, Lw., in Morelos, Mexico, it appeared from determinations of the hydrogen-ion concentration of soil under fallen guavas near which pupae of *A. striata*, Schin., had been collected that the acids of the fruit had soaked

out into the previously alkaline soil and produced a pH gradient ranging from 3.6 under the fruit to 7.2 near the pupae, all of which were lying practically equidistant from the centre of each fruit. In experiments, *A. striata* was more sensitive to acids than *A. ludens*. Fully grown larvae of *A. ludens* when distributed evenly over a petri dish containing soil that had been acidified in the centre to pH 2.8 pupated around the edges where the pH was 7.8, whereas when the soil was acidified round the edges they pupated in the centre. Lowering the pH to 4.5 did not increase the death rate of either larvae or pupae, but the time taken to pupate was 3 times as long as at pH 8.7. Lowering the pH to 3.2 or 2 caused the larvae either to pupate at once and emerge as normal flies, or to take a very long time to pupate with a correspondingly increased mortality in the puparia. Such data account for the fact that sour lime with a pH of about 2.0 is never infested. Almost all infested districts in Mexico had alkaline or nearly neutral soils. In a few uninfested sections the soil was slightly acid. Larvae will move considerable distances over unsuitable soil in search of good places to pupate.

It had hitherto been believed that adults of *A. ludens* did not live more than 6 months, so that a host-free period of 7 months, such as was established in the Rio Grande Valley, California, where infested zones are given over to a single fruit crop, should have been an effective means of eradication. In laboratory studies in Mexico, where a series of different host fruits are always available in the same orchard, the possible life-cycle at 21°C. [70°F.] under insectary conditions was estimated at 13 months. The adult females died sooner than the males, but were kept alive for up to 11 months. Both series could remain fertile for at least 7 months. A fly can live for long periods on yeasts and sugars, the availability of which in the field is independent of the presence of host fruits.

Copper chloride, which was used to keep down the growth of moulds in dishes in which the pupae were kept, was highly toxic to newly emerged flies. Tests, in which various compounds of copper made up in a bait-spray mixture of 25 gm. granulated sugar, 50 cc. maple syrup, 1 gm. copper compound and 1,000 cc. distilled water and fed to the flies at 71°C. were compared, confirmed the findings of Miller and McBride [20 130]. Copper chloride, copper nitrate, copper sulphate and copper carbonate were all toxic. This action is apparently associated with the destruction of yeasts and moulds that may be a necessary part of the diet of the flies.

Diachasma (Opius) crawfordi, Vier., which frequently parasitises *A. ludens* in mangos in Morelos, lays its eggs in the larvae still within the fruit. The host larva matures and forms a normal puparium in the soil, but by the time it would have pupated, it has disappeared and the parasite larva is visible within the otherwise empty shell. The adult parasite emerges at about the same time as its host would have done. From material collected immediately after pupation and kept in the laboratory at constant temperatures, 95 per cent. of *A. ludens* emerged regularly at non-lethal temperatures. *A. ludens* emerged at temperatures between 51.8 and 88.7°F., and *D. crawfordi* between 53.6 and 84.2°. *A. ludens* developed normally at temperatures ranging from 58.1 to 82.4°F., but its parasite suffered fairly high mortalities at temperatures only a few degrees above or below its optimum of 77°F. The length of its life-cycle is also more affected by variations in temperature than that of the host.

When 283 males and 133 females of *D. crawfordi* were kept in cages and supplied with cane lump sugar and a dish of wet absorbent cotton, the females live longer than the males. Those that emerged in March lived longer than those that emerged in February, but not so long as those that emerged in May. The temperature had been maintained at a fairly constant average of 69.8°F., but the relative humidity had increased sharply with the first rains in April and remained higher than in February. Owing to the lack of air circulation and the constant supply of water in the cages, humidity inside them was probably somewhat higher than in the room. From temperature records and the humidity record of the room alone, there appears to be a critical point at about 30 per cent., below which *Diachasma* dies off very rapidly. Accidental drying up of the water dishes in the cages in June would, however, suggest that a humidity not higher than 50 per cent. can cause considerable damage.

Parasitism among larvae of *A. ludens* collected in the field declined almost to zero as the dry season advanced and increased when the rains came. The abundance of parasites seems to depend neither on the number of host larvae nor on the quantity of fruit available, as parasitism is very low during February–March, when there are numerous fruit fly larvae in off-season mangos. Adults of the parasite are rare during the dry months.

CLARK (C. A.). **The European Corn Borer and its controlling Factors in the Orient.**—*Tech. Bull. U.S. Dep. Agric.* no. 455, 37 pp., 8 figs., 15 refs. Washington, D.C., November 1934. [Recd. March 1935.]

In continuation of earlier investigations on the parasites of *Pyrausta nubilalis*, Hb. [cf. *R.A.E.*, A **22** 114], the author prefaces his account of further studies from 1930 to 1932 in Japan, Korea, Manchuria and Formosa with information about climatic and agricultural conditions in various parts of these countries. *P. nubilalis* has a single generation in the northern sections, two in the intermediate and three or more in the southern. Information on its food-plants has already been noticed [*loc. cit.*]. No one parasite or group of parasites attacks it in all the sections. Thus in the warm southern sections of Japan, *Eulimneria alkae*, Ell. & Sacht., is not found at all and *Angitia* (*Inareolata*) *punctoria*, Rom., is rare, but *Cremastus flavo-orbitalis*, Cam., and the Tachinid commonly called *Ceromasia senilis*, Mg., for which the name *Lydella grisescens*, R. D., is here adopted [cf. *loc. cit.*], parasitise a considerable though variable percentage of the larvae. Conversely in the colder sections of Japan and south-east Manchuria *Cremastus flavo-orbitalis* and *Ceromasia senilis* are unimportant, but *E. alkae* and *A. punctoria* are valuable. In the Heijo section of Korea, which has an intermediate climate, *C. senilis*, a southern species, and *A. punctoria*, a northern species, become alternately important with fluctuations of climate, and the dominant species is *Macrocentrus gifuensis*, Ashm., which is hardly ever found in south-eastern Manchuria. Consignments of the larval parasites, *Nemorilla floralis*, Fall., *Phorocera erecta*, Coq., and *Apanteles thompsoni*, Lyle, and of the pupal parasites *Trichomma cnaphalocrocis*, Uchida, and *Brachymeria euploeae*, Westw., were shipped to United States, as well as of all the insect parasites previously noticed [*loc. cit.*] except *Xanthopimpla punctata*, F. Other parasites not mentioned in the previous report [*loc. cit.*] were an undescribed

species of *Campoplex* and *Microbracon* sp., both of which attacked the larvae, and *Labrorychus tenuicornis*, Grav., a pupal parasite. Some parasites, such as *Apanteles thompsoni*, *N. floralis* and *Agathis (Bracon) atricornis*, Smith, are also found in Europe, but are generally more numerous in the Far East. Certain parasites found in the Far East, such as *M. gifuensis* and *Angitia punctoria*, although morphologically indistinguishable from similar species found in Europe, nevertheless exhibit biological differences when liberated in North America.

NORRIS (D.), GLOVER (P. M.) & ALDIS (R. W.). **Lac and the Indian Lac Research Institute.**—Cr. 4to, 53 pp., 11 pls., 1 graph. Namkum, Ranchi, Indian Lac Res. Inst., October 1934. Price Rs.2.8. [Recd. March 1935.]

This general survey of the lac industry in India and the progress made by the Indian Lac Research Institute since its inception 9 years ago, includes a summarised outline of the results of research on *Laccifer lacca*, Kerr, its insect enemies and their parasites, and the pests of its food-plants.

Microbracon hebetor, Say, which is recorded for the first time from India, has recently been found as an ectoparasite of the major predators of lac, *Eublemma amabilis*, Moore, and *Holcocera pulverea*, Meyr., and of the minor predator, *E. scitula*, Rambr., and has been reared in the laboratory. Beetles, including *Tribolium castaneum*, Hbst., are associated with lac, probably as scavengers, though they may damage material in storage.

Insects injurious to trees that serve as food-plants include the Cercopid, *Machaerota planitiae*, Dist., which occurs in *Zizyphus jujuba* [cf. R.A.E., A 19 26], and also serves as an alternative host of *Eupelmus tachardiae*, Hav., a parasite of lac; *Thiacidas postica*, Wlk., which defoliates *Z. jujuba* and *Z. xylopyra*; *Myllocerus cardoni*, Mshl., which occurs on a wide range of plants; *Sathrophyllia rugosa*, Melsh., which feeds on the young shoots of *Butea frondosa*; and *Celosterna scabrator*, F., which causes damage to *Acacia catechu* [cf. 20 209].

GLOVER (P. M.). **Department of Entomology.**—Rep. Indian Lac Res. Inst. 1933–34 pp. 10–27. Nankum, Ranchi, 1934. [Recd. March 1935.]

A brood of *Laccifer lacca*, Kerr, from *Croton oblongifolius* gave rise to healthy lac on *Zizyphus jujuba*, but was badly attacked by *Eublemma amabilis*, Moore. Beneficial results were obtained by a light pruning to promote an early rise of sap and thus eliminate the resting period, which in arid districts usually makes *Zizyphus* unable to carry lac through the hot weather to produce brood in July. Pests of the food-plants included several of those observed in the previous year [R.A.E., A 22 309]. *Coccus (Lecanium) longulus*, Dougl., which occurred on *Acacia farnesiana* and *Cajanus indicus*, was controlled by natural enemies, chiefly *Eublemma scitula*, Rambr. The Tettigoniid, *Sathrophyllia rugosa*, L., caused serious damage to *Butea frondosa* in April by severing the young shoots.

The parthenogenetic race of *L. lacca* has reached the ninth generation without harmful effects on fertility, resin secretion or the sex ratio of the progeny [cf. 21 131; 22 310]. The information given on many

of its natural enemies is similar to that already noticed [22 310; 23 86]. In June the egg stage of *Eublemma scitula* lasted 4-5 days, the larval 23-30, and the pupal 13. Hibernating larvae were found in October and November, and pupation occurred in March. A total of 20 generations of *Microbracon tachardiae*, Cam., was again reared in a year [22 310]. Females laid 19-84 eggs during August-November and 19-39 during the rest of the year. The oviposition period lasted 8-32 days and the life-cycle 9-33. This Braconid parasitised an average of 7.1 per cent. of the larvae of *Eublemma*. Females caged with material on which to oviposit lived longer during April-October than those without; the reverse occurred during November-March, when oviposition may have to be delayed in nature [cf. 18 638].

Progress Reports from Experiment Stations Season 1933-34.—Med. 8vo, viii+152 pp., ill. London, Empire Cotton Growing Corp., 1935. Price 2s. 6d.

The pests of cotton occurring in Africa during 1933-34 are discussed as in previous years [cf. R.A.E., A 22 224]. F. S. Parsons (pp. 19-25) records data on the American bollworm [*Heliothis obsoleta*, F.] at Barberton in the De Kaap Valley, Transvaal [cf. 22 676], in Swaziland, and in the Magut area, Zululand. At Barberton and Magut, large numbers of bollworms developed during winter and spring on irrigated lands [cf. 22 225] and during November-December on weeds, which were in flower and therefore attracted ovipositing moths over a long period. In late January increased oviposition on cultivated crops in the De Kaap area gave rise to the worst outbreak for eight years. No further increase took place in some areas because the plants wilted from lack of moisture, but even heavier infestations developed during February-April in others where the shortage was less acute. At Magut, extensive egg-laying was first recorded in December and earlier rain-grown crops were attacked as soon as they began to flower in December. Two further heavy attacks of successive generations occurred later. The maximum figure for oviposition was four times as high at Barberton as at Magut. Infestation in two districts in Swaziland was comparatively light, since there were no winter crops growing in irrigated areas, and since the spring was comparatively late and the rainfall less favourable to weeds. At Barberton and Magut, early-flowering maize was practically free from attack, but the later crops were rather heavily infested some weeks after the first outbreak appeared in the cotton districts. The moths, therefore, may rather spread from cotton to maize than from maize to cotton as has been suggested. It appears that the maize may divert the moths from cotton [22 225] unless they are unusually numerous. It is less attractive during cool, wet weather or if fresh growth and flowers have been produced after damage by locusts. Data on oviposition and plant development indicate that the moths are only associated with maize during tasselling, and that plantings should therefore be arranged to provide overlapping flowering periods. Among alternative food-plants, *Physalis* spp. were particularly attractive for oviposition and in one case, in Swaziland, seemed to be preferred to adjacent maize in fresh tassel, while ground-nuts, tobacco and beans (used as green manures) also seemed to have some attraction. Dusts of calcium arsenate, applied in due time, gave good results against the young larvae on cotton. Infestation was extremely heavy on vegetables and *Citrus*

in the Barberton district and Magut during the winter season 1934. The results of work with the Rhodesian strain of *Trichogramma* [cf. 22 226] were unsatisfactory, and attempts to use individuals bred in the laboratory have been abandoned.

E. O. Pearson (pp. 26-29) reports on work on the winter food-plants and distribution of *Dysdercus* spp. and on the populations on *Sterculia rogersi* and cotton in various districts in South Africa. In general the position on cotton was similar to that in the preceding year. *D. nigrofasciatus*, Stål, was again the most abundant species. The highest populations were under 4,000 adults per acre except on one farm where there were 19,000. The collection of occasional individuals of *D. superstitiosus*, F., constituted the first record of this species south of Rhodesia. Migration to the crop began when or slightly before the bolls started to open. All species appeared about the same time, and no migration occurred during the early and main flowering periods. The greatest number of adults and nymphs therefore occurs some time after the peak of the bolling curve, and this may in part account for the small percentage of staining. Sterile bolls exposed to young nymphs of *D. nigrofasciatus* did not develop internal boll disease, though they contained many punctures, but others exposed to older nymphs developed heavy infections of both *Nematospora gossypii* and *N. coryli*. Apparently the early instars are either physiologically incapable of harbouring the fungus or, since they feed largely on exposed seed in open bolls, are less likely to get it in a viable state than the later instars, which feed on the interior of unopened bolls.

J. E. Peat (pp. 52-63) reports from Southern Rhodesia that the status of the American bollworm [*Heliothis obsoleta*, Hb.] at Gatooma has changed little during the last few years. In two other districts it was more injurious because cotton was treated as a secondary crop and planted late. The fact that heavy oviposition does not occur on cotton in the maize-growing districts until after the principal maize crops have passed the attractive stage, and that even then a variety of other crops may prove at least as attractive as cotton, indicates that outbreaks on cotton like those experienced in other cotton-growing areas will probably not happen in Rhodesia. Planting should take place early so that as many bolls as possible may set before *Heliothis* migrates from maize, and it should be regulated so that at the critical period (late February to early March) some other farm crops are in an attractive stage. In tests, as many eggs were laid on cotton as on traps of late maize. The larger and more vegetative a plant within a crop the greater the apparent attraction. In small areas maize was most severely attacked if very late, and oviposition began before the plants had reached the tasselling stage. Less than half as many eggs were counted on 100 cotton plants set 6 inches apart as on those set 2 ft. from each other. Apparently less than 10 per cent. of the eggs hatched; 30-50 per cent. were parasitised by *Trichogramma luteum*, Gir., during the period of heavy oviposition, and the predator, *Orius* sp. was also active. The Sudan bollworm [*Diparopsis castanea*, Hmps.] has caused considerable loss during March-May in the last few years to maturing bolls remaining from previous infestation by *Heliothis* and from natural shedding. It is believed that the attacks have increased largely because an endemic population has been built up. Standover cotton was left as a trap to attract the moths emerging with the early rains from hibernating pupae. Only a few eggs were laid on the traps during September-October, but by mid-November the numbers had

become considerable and at the end of March they were almost thrice as great as they had been in November. Oviposition was considerably reduced on the annual cotton crop. Larvae developed successfully and pupated, having fed only on the flower buds. Moths oviposited freely on bushy perennial cotton. Ratooning is considered highly inadvisable. Fluctuations in the numbers of *Dysdercus* spp. are outlined. Traps of seed cotton were effective during the first 2-3 weeks but after the end of February far less stainers were attracted by them although the total population increased.

A. G. Bebbington and W. Allan (pp. 76-80) give an account of work at Mazabuka, Northern Rhodesia, on *Dysdercus* and *H. obsoleta*. The distribution of *D. supersticiosus*, which had an abnormally large early influx, and of *D. fasciatus*, Sign., was determined by the amount of damage that had been done by the bollworm. Preliminary investigations indicated that early staining of the bolls is due to bacteria and that *Nematospora* appears later, probably in correlation with *D. fasciatus*. The stainers were also studied in relation to their alternative food-plants. *Heliothis* appeared early in February and became very harmful in March and April. The plants were entirely stripped and yielded only 16 lb. seed cotton per acre. In such a heavy infestation cotton was not protected by maize from serious damage, but it was completely destroyed where it was grown without trap crops. Severe injury to maize and *Sorghum* was recorded from some areas. Cotton plots cultivated by natives remained free from infestation, possibly because they grow numerous other crops which have different flowering periods and are therefore more attractive. Totals of 593,000 and 536,000 eggs were laid per acre on cotton and maize respectively at the farm and of 1,747,000 and 757,000 at the Station, where the growth of maize was more irregular and where the moths had to fly over cotton in moving from one maize crop to another. Parasitism, chiefly by *Trichogramma luteum*, was consistently higher in maize than in cotton.

W. L. Miller and S. T. Hoyle (pp. 127-129) record that flying swarms of the red-winged locust [*Nomadacris septemfasciata*, Serv.] appeared at Domira Bay, Nyasaland, early in December, and killed early beans and injured some newly germinated maize. Eggs were laid about mid-December, but so many were destroyed by the larvae of a Meloid that few hoppers appeared and no appreciable damage was done. Young flying swarms that had settled for the night early in April ate the bark of cotton and caused some bolls to fall. According to records of infestation by *Dysdercus* at the Station there were less than 500 individuals per acre during March to mid-May. The numbers increased to a maximum of 5,000 at the end of this month and decreased again in June, when the crop was harvested. *D. fasciatus* was much the commonest species. Of the little staining that occurred, the greater part was observed at the beginning of the season. The wild food-plants are briefly discussed.

PRIESNER (H.). Ueber HCN-Vergasung in Aegypten. [Fumigation with Hydrocyanic Acid Gas in Egypt.]-*Neuheiten PflSch.* **28** no. 1 pp. 1-3. Vienna, February 1935.

This brief account of fumigation of *Citrus* trees in Egypt with hydrocyanic acid gas is given in view of the occurrence of the San José Scale [*Aspidiotus perniciosus*, Comst.] in Austria [cf. *R.A.E.*, A **22** 717, etc.]

The Coccids involved are *Chrysomphalus ficus*, Ashm., which is the most dangerous; *Aonidiella aurantii*, Mask., which in recent years has

spread more in Upper Egypt ; and *Lepidosaphes beckii*, Newm., and *Aonidiella* (*Chrysomphalus*) *personata*, Comst., which are found in the north. Fumigation became compulsory in 1923 and is carried out by the government. Plants imported into Egypt are also disinfested with HCN. Vacuum fumigation is used against very resistant insects.

RIPPER (W.). **Die tierischen Schädlinge des Feldbaues im Jahre 1934.** [Animal Pests of Agriculture in Austria in 1934.]—*Neuheiten PflSch.* **28** no. 1 pp. 7-8. Vienna, February 1935.

This is a list of pests of field-crops observed in Austria in 1934. Those recorded for the first time in the country include *Haplothrips tritici*, Kurdj., *Pedinus femoralis*, L., and *Meromyza saltatrix*, L., on cereals ; *Lupeirina* (*Apamea*) *testacea*, Schiff., on maize ; and *Jaapiella medicaginis*, Rüb., on lucerne.

KAYSING (P.). **Bekämpfung des Engerlings mit chemischen Mitteln.** [Chemical Control of Lamellicorn Larvae.]—*Ernähr. Planze* no. 2 1934. (Abstr. in *Neuheiten PflSch.* **28** no. 1 p. 19. Vienna, February 1935.)

In Germany kainit has been found useful against Lamellicorn larvae in forests and cereal fields. In the forests from 500 to 750 lb. per acre applied along the rows of young trees caused the larvae to migrate to untreated ground. In Brandenburg the larvae have been observed attacking cereals, and fair results were obtained by spreading about 700 lb. kainit over each acre just before rain. With about 1,100 lb. all the larvae were destroyed. Its effect could be noticed after four weeks, and reached its maximum three months later.

MÜLLER (H.). **Drahtwürmer.** [Wireworms.]—*Wiener landw. Ztg.* **84** 1934 p. 117. (Abstr. in *Neuheiten PflSch.* **28** no. 1 p. 19. Vienna, February 1935.)

In Hungary good results have been obtained against wireworms by sowing maize in rows. When the maize in the ground begins to swell it is attacked by the larvae, but is still able to sprout. The young plants are then pulled up, and the larvae destroyed. It is suggested that when beet is sown maize should be mixed with the seed. Pieces of potato buried as baits should be placed at intervals of 2 yards in rows 5-6 yards apart. After 9 days the larvae can be removed from the baits. Kainit, at 600-700 lb. per acre, drives the larvae down from the surface and so prevents harm. Abundant applications of calcium cyanamide also prevent attack.

EGERMANN (E.). **Neues von der Rüsselkäferbekämpfung.** [New Methods against Weevils.]—*Wiener landw. Ztg.* **84** 1934 p. 100. (Abstr. in *Neuheiten PflSch.* **28** no. 1 pp. 19-20. Vienna, February 1935.)

At Königshof, weevils of the genera *Cleonus* and *Otiorrhynchus* are trapped by placing large bundles of branches of *Prunus padus* with the first tender leaves in fields that have been raked at the time of sowing the summer crop of beet. After 2 hours in sunny or 12 in cloudy weather, the starving weevils collect under the bundles, and their abundance can be estimated. Beet should be sown first in fields with

only a few weevils. If the weevils are abundant, bundles of branches are placed at intervals of about 40 yards in rows about 40 yards apart, and the weevils under them are killed with a flame-thrower. Branches of other trees may be substituted for those of *P. padus*, but the weevils avoid birch.

ZULAUF-WILDI (—). **Ein sicherer Schutz der neugepflanzten Reben gegen Engerlinge.** [A sure Protection of newly planted Grapevines against Lamellicorn Larvae.]—*Schweiz. Z. Obst- u. Weinb.* 1934 no. 8 p. 145. (Abstr. in *Neuheiten PflSch.* **28** no. 1 p. 23. Vienna, February 1935.)

In Switzerland newly-planted grape vines are protected against Lamellicorn larvae by dipping the plants in a fairly fluid paste of clay and then sprinkling them with a fine glass dust. The vines must be planted while the coating is still moist and sticky. Fruit trees also may be protected in this way.

KASERER (—). **Das Weingartenland vor der Pflanzung.** [The Vineyard Land before Planting.]—*Landwirtschaft* 1934 no. 4 p. 86. (Abstr. in *Neuheiten PflSch.* **28** no. 1 pp. 23–24. Vienna, February 1935.)

Land intended for grape-vine nurseries or new vineyards in Germany in 1934 and 1935 was left unplanted in 1933, which was a flight-year of *Melolontha*, and the surface was dried by harrowing a few times just before the appearance of the beetles. A phosphate fertiliser was spread when they appeared. During the flight-period the ground was harrowed in dry weather every 10 days to expose the eggs. After the flight, inspection of potato baits disclosed only very slight attack. The value of the chemical manure was not proved, but during the flight-year stable manure is too attractive to be used.

LEUZINGER (H.). **Versuche zur Engerlingsbekämpfung im Wallis.** [Experiments against Lamellicorn Larvae in Valais.]—*Schweiz. Z. Wein- u. Obstb.* 1934 no. 10 p. 173. (Abstr. in *Neuheiten PflSch.* **28** no. 1 p. 24. Vienna, February 1935.)

In the Swiss canton of Valais crude naphthalene spread over the bare ground beneath fruit-trees prevented oviposition by *Melolontha* in 1926 and 1929, which were flight years. In 1929 two applications, each of about 2,000 lb., were made to 7 acres. In 1931 strawberries were planted between the rows, and in the flight year 1932 their attractiveness overcame the repellent effect of the naphthalene. As many as 260 larvae were found on the roots of a single tree. The strawberries were heavily infested by young larvae even in 1932.

KIMMINS (D. E.). **Notes on the Life-history of the Death Watch Beetle.**—*Proc. S. Lond. ent. nat. Hist. Soc.* 1933–34 pp. 133–137, 1 pl. London, 1934.

Xestobium rufovillosum, De G., the larvae of which bore in dead wood and structural timber, has been recorded in Britain from oak, chestnut, willow, beech, hawthorn and ash in the open and from structural oak and chestnut in buildings and from pine fastened against oak. No larvae succeeded in establishing themselves in freshly-seasoned oak.

The adults are most active in warm weather ; they appear seldom to fly. The tapping of the beetle occurs before pairing during late March–May. The females do not oviposit for 5–11 days after pairing and live about 3 weeks. The males live about 2 weeks. The eggs [*cf. R.A.E.*, A **13** 533] hatch in 22–30 days [*cf. 19* 72, 367]. The larvae are apparently unable to burrow into the wood without the aid of a crack. The larval stage lasts at least 3 years and probably varies according to the condition of the wood, being prolonged when it is old or dry. Burrows about 4 mm. in diameter are constructed at first along the grain of the wood and finally across the grain towards the surface. The pupal period probably occupies about 3 weeks, but the experiments were interrupted by the predacious Tarsonemid, *Pediculoides ventricosus*, Newp., which has not previously been recorded as attacking *Xestobium*. The adults emerge in July or early August but do not appear from the wood until the following spring and early summer. Brief descriptions are given of all stages.

AUSTIN (M. D.), JARY (S. G.) & MARTIN (H.). **Control of the Common Green Capsid Bug : With Special Reference to the Use of Tar-Petroleum Oil Winter Washes.**—*J. Minist. Agric.* **41** no. 12 pp. 1195–1205, 13 refs. London, March 1935.

Lygus pabulinus, L., feeds on the growing tips of currants and other bush fruits in commercial plantations in England. Measures recommended against it up to 1931 are reviewed. Laboratory investigations since 1931 indicate that emulsions of tar and petroleum oils are suitable winter washes against the eggs [*R.A.E.*, A **22** 515 ; etc.], and an account is given of their preparation and use in plantations in Kent during 1931–34. A spray containing 3 per cent. strained anthracene oil and 6 per cent. petroleum oil may be applied in mid-February to heavily infested currants and one consisting of 3 per cent. tar oil and 4.5 per cent. petroleum oil may be used on those that received the 9 per cent. spray in the previous year or that are less heavily infested. The pressure of the applications did not seem to matter if the shoots and branches were thoroughly covered. Sometimes the washes slightly retard the development of the leaves, and in 1934 this tendency served to accentuate the effect of frost in April. Treated bushes have yielded a crop equal to the seasonal average in the district and have grown more healthy wood, and the percentage of infested shoots has been reduced to 2 as compared with 50–100 on unsprayed plants.

Specifications of the ingredients are given. The oils are emulsified by the two-solution method [**17** 673 ; **19** 612, etc.] with oleic acid in the oil mixture and sodium hydroxide in the water, used at the rate of 1 gal. and 1½ lb., respectively, to 100 gals. spray. Tar oils, which are incorporated chiefly to destroy the eggs of Aphids, should be free from alkali, which would react with the oleic acid to form a solid soap difficult to dissolve in cold water. Where the water is very hard, the oils may be emulsified with Bordeaux mixture (4 : 6 : 100). Both methods of preparation give equally satisfactory results [*cf. 21* 490].

Experiments on a small scale indicated that gooseberries and cultivated blackberries, in which the Capsid frequently oviposits and feeds, are more susceptible to injury than currants and should be sprayed earlier if the 9 per cent. concentration is used. Petroleum oil alone at a concentration of 6 per cent. appears to cause little or no injury in February.

WILSON (G. F.). **Woolly Aphis and Nasturtium** (*Tropaeolum*): **A Fallacy**.—*Gdnrs' Chron.* (3) **96** p. 391, 1 fig., 2 refs. London, 1st December 1934.

References to the popular theory that the woolly aphis [*Eriosoma lanigerum*, Hsm.] may be eradicated by planting nasturtium (*Tropaeolum*) beside infested apple trees and allowing it to climb up the trunks are quoted from the literature. Various tests carried out in England at intervals since 1920 have failed to confirm this theory. The original idea of growing nasturtium round the stems of the trees appeared to be based on the belief that its presence would prevent the migratory root stem form from ascending the stems in the spring. In the case of two apple trees at the base of which nasturtium was sown in April 1934, not only was there no reduction in infestation but masses of the root-stem form of *E. lanigerum* were found clustered at the base of the nasturtium plants very near the apple roots on 12th November. The branches of the apple trees were heavily infested on 12th October, although a profuse growth of nasturtium covered the trees to a height of 5 ft. above soil level from May to October.

WILSON (G. F.). **Additional Hosts of *Anomoea antica* Wied. and *Spilographa alternata* Fall.**—*Ent. mon. Mag.* **71** pp. 58–60, 2 figs., 9 refs. London, March 1935.

Phagocarpus permundus, Harr. (*Anomaea antica*, Wied.) is recorded from species of *Berberis*, *Cotoneaster* and *Pyracantha*, and *Rhagoletis* (*Spilographa*) *alternata*, Fall., from numerous species of rose in Surrey during 1928–34. The normal fruit infested by the former appears to be *Crataegus monogyna*.

MEYRICK (E.). **Exotic Microlepidoptera, iv, pt. 18.**—pp. 545–576. Marlborough, Wilts, the author, April 1935. Price 3s. per pt.

Among the new species described are the Pyralids, *Eleusina phloeophaga*, feeding on the bark of loquat (*Eriobotrya japonica*), and *Ereboenis saturata*, gen. et sp. n., on tea in India; the Tineid, *Decadarchis heliotoxa*, infesting male inflorescences of coconut in the Solomon Islands; and *Tortrix* (*Cacoecia*) *transcutata*, on *Citrus* in Java.

WARBURTON (C.). **Annual Report for 1934 of the Zoologist.**—*J. R. agric. Soc. England* **95** pp. 532–537. London, 1934. [Recd. March 1935.]

Many of the usual pests were comparatively scarce in England during 1934. Wheat was damaged by the larvae of *Trachea* (*Apamea*) *secalis*, L., in a restricted area in early spring, and by *Helophorus nubilus*, F., which was particularly injurious to crops following sainfoin. Wireworms were unusually destructive to cereals. Investigations on *Brevicoryne brassicae*, L., on crucifers have shown that it does not carry over from one crop to that of the following year on cruciferous weeds, as was previously supposed, but that practically all the eggs are laid on the stalks and leaves of the food-plant. Plants remaining in the soil during the spring of the second year are therefore sources of infestation, and old stumps should be destroyed and seed crops should be sprayed with nicotine and soft soap in April before the appearance of the winged forms. Crucifers were also damaged by the cabbage root-fly [*Phorbia brassicae*,

Bch.]. Plums were severely attacked by *Hyalopterus arundinis*, F. The woolly apple aphid [*Eriosoma lanigerum*, Hsm.] was more abundant than ever on apples, but in some cases it was eradicated by establishing *Aphelinus mali*, Hald. [cf. *R.A.E.*, A 23 127]. The second brood of the codling moth [*Cydia pomonella*, L.] was destructive to apples.

MEDER (O.). **Uebersicht über die bisher auf den Nordfriesischen Inseln, besonders Amrum, festgestellten Kleinfalter nebst Beschreibung dreier neuer Formen.** (Mitteilung über Kleinfalter der Nordmark ii.) [Survey of the known Microlepidoptera of the North Frisian Islands, especially Amrum, with Descriptions of three new Forms. (Contribution to the Microlepidoptera of the Nordmark ii.)—*Schr. naturw. Ver. Schl.-Holst.* 20 no. 2 pp. 357–364, 2 refs. Kiel, 1934. [Recd. April 1935.]

This list includes a note on *Borkhausenia* (*Hofmannophila*) *pseudospretella*, Stn., recorded as a pest in houses on the Islands where it was destructive to collections of Lepidoptera and occurred in mattresses filled with wild-goose feathers and in upholstered furniture.

DE BUSSY (L. P.), VAN DER LAAN (P. A.) & JACOBI (E. F.). **Resultaten van proeven met Derrispoeder en rotenon op Nederlandsche insecten.** [Results of Tests with Derris Powder and Rotenone on Netherlands Insects.]—*Tijdschr. PlZiekt.* 41 no. 2 pp. 33–50, 2 pls., 15 refs. Wageningen, February 1935.

In Holland derris has proved effective against *Byturus* [*tomentosus*, F.] on raspberry [*R.A.E.*, A 22 462], and *Depressaria* [*nervosa*, Haw.] on caraway.

In the course of an extensive series of laboratory and field experiments two lots of derris powder were tested, one yielding 2 per cent. rotenone and 8 per cent. ether extract, and the other 8 per cent. rotenone and 21 per cent. ether extract. The latter was used either as a dust, alone or mixed with an inert carrier, or in a spray. The latter was a mixture of powder with water and a spreader, or a watery extract with a spreader, or pure rotenone, dissolved in 25 parts acetone, and then further diluted with water and a spreader.

One application of a derris dust mixed with kaolin to a rotenone content of 2 per cent. was very effective against *Pieris brassicae*, L., and *P. rapae*, L., on cabbage; it is advisable to dust early, since the larvae are easily reached on young plants. A dust containing 2 per cent. rotenone killed 92 per cent. of *Nygmia phaeorrhoea*, Dön. (*Euproctis chrysorrhoea*, auct.), while a spray of lead arsenate killed only 20 per cent. A spray with a rotenone content of 1 : 5,000 killed 68 per cent. The dust killed 90 per cent. of *Porithetria* (*Lymantria*) *dispar*, L., in the laboratory, and was useful against *Abraxas grossulariata*, L., on gooseberry bushes, *Galerucella viburni*, Payk., on *Viburnum* and *Calocoris norvegicus*, Gmel. (*bipunctatus*, F.) on beans. A dust containing 0.5 per cent. rotenone was effective against *Agelastica alni*, L., on alders. It is concluded that a dust containing about 1 per cent. rotenone is suitable against most Lepidopterous larvae, sawfly larvae, larvae and adults of leaf-eating beetles, and plant bugs. *Eriosoma lanigerum*, Hsm., was controlled by two applications of a spray containing derris dust and soap, the rotenone content being 1 : 5,000 and 1 : 10,000. A spray containing derris powder and soap (rotenone

1:5,000) gave 90–95 per cent. control of Tetranychid mites. The results against Coccids were unsatisfactory, and thrips infesting *Gladiolus* were difficult to get at, but were quickly killed if they were reached.

MEHMET BEKIR. **Experimentelle Untersuchungen über den Einfluss von Temperatur und Luftfeuchtigkeit auf die Sterblichkeit und Entwicklung des Ringelspinners, *Malacosoma neustria* L.** [Experimental Investigations on the Influence of Temperature and Humidity on the Mortality and Development of *M. neustria*.]—*Z. angew. Ent.* **21** no. 4 pp. 501–522, 13 diagr., 29 refs. Berlin, February 1935.

This paper describes in detail laboratory experiments at Munich on the effect of temperature and humidity on *Malacosoma neustria*, L., the larvae being fed on apple leaves.

The eggs overwinter, but the larvae in them are fully developed at the end of autumn. The favourable temperature for hatching was between 11 and 21°C. [51·8 and 69·8°F.] at a humidity of 90 per cent., with a vital optimum at about 17°C. [62·6°F.], and lethal limits over 32°C. [89·6°F.] and under 4°C. [39·2°F.]. Of 2,017 eggs, 160 were parasitised by *Trichogramma* sp. The zone of least (0–10 per cent.) mortality for the first instar larvae was extensive, ranging between 11·5 and 31·5°C. [52·7 and 88·7°F.] at 12–100 per cent. humidity, with a vital optimum of 21·5°C. [70·7°F.] and 100 per cent. humidity. The upper fatal limit was 37·5–38·5°C. [99·5–101·3°F.] and the lower 7°C. [44·6°F.]. Starving first instar larvae survived longest (36 days) at 6·3°C. [43·34°F.] and 100 per cent. humidity. The pupae were very resistant to temperatures between 18·5 and 31·5°C. [65·3 and 88·7°F.] and to humidities between 75 and 90 per cent. With larvae bred between 18·5 and 31·5°C. and at humidities of 75–90 per cent., the pupal weight of both sexes was highest at 22·7°C. [72·86°F.]. In the case of the females, there was an approximately linear relation between pupal weight and production of eggs. On an average the sexes were equally represented irrespective of the temperatures at which the larvae developed.

Thresholds of development and thermal constants are given for all stages. Female larvae required a longer time for development than the males, while the contrary applied to the pupae.

STATELOW (N.). **Experimentelle Untersuchungen zur Oekologie des Baumweisslings *Aporia crataegi* L. (Der Einfluss von Temperatur und Luftfeuchtigkeit auf Entwicklungsdauer und Sterblichkeit.)** [Experimental Investigations on the Ecology of *A. crataegi*. The Influence of Temperature and Humidity on the Duration of Development and on Mortality.]—*Z. angew. Ent.* **21** no. 4 pp. 523–546, 14 diagr., 45 refs. Berlin, February 1935.

A full account is given of experiments at Munich on the effect of temperature and humidity on development and mortality of *Aporia crataegi*, L., starting with larvae received from Poland in March 1933, the nests being on branches of hawthorn (*Crataegus oxyacantha*).

The rate of pre-imaginal development depended on temperature, humidity being unimportant. The threshold temperatures and thermal constants are given for the hibernated third instar larva in spring, for larvae of the fourth, fifth and second instars, and for pupae of both

sexes, as well as the thermal constants for third instar larvae in autumn. The zone of least mortality for the overwintered third instar larva was at 16–35°C. [60·8–95°F.] and 55–100 per cent. humidity. The optimum temperature zone was narrow at 100 per cent. humidity and was widest at 75 per cent. The spring period of the third instar is regarded as a critical stage. Pupae from larvae kept continuously at 55–100 per cent. humidity reached their maximum weight at 20·9°C. [85·82°F.]. Temperatures during larval life did not affect the proportion of the sexes in the adult stage, but humidity was a factor. At 18 per cent. humidity the percentage of females was greatest (80) and at 75 per cent. it was smallest (35).

PETERS (G.) & GANTER (W.). **Zur Frage der Abtötung des Kornkäfers mit Blausäure.** [The Question of destroying *Calandra granaria* with Hydrocyanic Acid Gas.]-*Z. angew. Ent.* **21** no. 4 pp. 547–559, 6 figs. Berlin, February 1935.

Calandra granaria, L., which destroys 2–3 per cent. of harvested cereals in Germany, is somewhat resistant to hydrocyanic acid gas, and the fact that it survives high concentrations has led to the assumption of an occurrence of a shock action similar to the "protective stupefaction" of Coccids [cf. *R.A.E.*, A **20** 32]. The experiments here described, however, showed that such an action does not occur, since the mortality curves are functions of time of exposure and gas concentration at various temperatures.

About 60 preliminary tests showed that reliable average results can be obtained. They were followed by about 240 separate tests, using a special apparatus in which gas concentration, temperature and humidity could be kept constant at any desired degree and could be readily verified. To allow of 6 simultaneous tests, 6 glass filter cells were grouped round a gas distributor common to all. The gas was supplied to the distributor through a coil in which it was warmed on its way from the gas generator. The weevils were placed together with grains of wheat in the cells, through which the gas flowed at the rate of 5 mm. per second to tubes that discharged it into an outlet pipe. The cells, distributor, and coil were contained in a water-bath.

The results are plotted. The time of exposure required at 17°C. [62·6°F.] was about $3\frac{1}{2}$ times as long as at 35°C. [95°F.]. Concentrations equivalent to from $2\frac{1}{2}$ to 30 oz. CN per 1,000 cu. ft. were used. At 17°C. 11·5 oz. gave 100 per cent. mortality in 10 hours, 15·5 in 8, 24 in $4\frac{1}{2}$, and 30 in $3\frac{1}{2}$. At 35°C. 2·5 oz. gave 100 per cent. mortality in 9 hours, 3·8 in 7, 5 in $4\frac{1}{2}$, 8·5 in 4, 11 in 3, 16 in $2\frac{1}{2}$, 21·5 in 2, and 30 in $1\frac{1}{2}$. The curves obtained at these and other temperatures showed that the effect of hydrocyanic acid gas on *C. granaria* could be expressed mathematically by Haber's formula [**23** 121]. Experiments at 0°C. [32°F.] showed that the result at this temperature did not differ materially from that at 17°C., and it even seemed as if *C. granaria* was rather more sensitive at the lower temperature, perhaps because of numbness.

In practical fumigation work the concentrations are never kept constant. Nevertheless, if the fluctuations in concentration over a given time and the conditions in which fumigation is to take place are approximately known, the concentration required to produce complete mortality can be mathematically calculated from the results of

laboratory experiments by a modification of Haber's formula. Separate experiments confirmed the reliability of this method for practical fumigation.

ERMOLAJEW (W.) & WASSILJEW (W.) [VASIL'EV (V.)]. **Zur Kenntnis schädlicher Lepidopteren sibirischer Nadelhölzer.** [A Contribution to the Knowledge of injurious Lepidoptera of Siberian Conifers.]—*Z. angew. Ent.* **21** no. 4 pp. 560–565, 11 refs. Berlin, February 1935.

Notes are given on Lepidoptera observed in various parts of Siberia. The presence of both old and young larvae of the Lasiocampids, *Dendrolimus pini*, L., and *D. sibiricus*, Tshtv., on pines in autumn and spring indicated a two-year generation, due to the long, cold winter, late spring, and early autumn frosts. The larvae began to enter hibernation as early as September. *D. sibiricus* was found in a forest of *Pinus cembra* var. *sibirica*. The larvae are polyphagous [*R.A.E.*, A **16** 486], but in feeding experiments they preferred the species of tree from which they had been taken.

In August 1933 numerous firs (*Abies sibirica*) were found withered in a stand of healthy pines, the injury being due to *Semiothisa signaria*, Hb., which, especially in the younger larval instars, feeds very wastefully. Adjoining young pines were not touched. In Siberia it feeds on pines only exceptionally, but is common on spruce and larch. In East Siberia the adults occur in the second half of July and the larvae in August and September. There is a long prepupal period and the pupae hibernate. In the laboratory pupation occurred early in September with adult emergence on 27th October. In 1933, this Geometrid was found to have destroyed *A. sibirica* over about 500 acres and had increased over about 500,000 acres. In September about 78 per cent. of the larvae were found killed by parasites.

Early in June 1933 two young larvae of the Lymantriid, *Dasychira abietis*, Schiff., were taken on branches of *Abies sibirica* and one reached the adult stage a month later. An adult was taken on 10th August in a mixed stand. A young larva, presumably of a new generation, was found on 18th August. Two empty pupal cases were found on the terminal shoots of branches of *Abies sibirica* and *P. cembra* var. *sibirica*, on the underside not far from the ground.

KLEINE (R.). **Die Borkenkäfer (Ipidae) und ihre Standpflanzen. Eine vergleichende Studie. II. Teil.** [The Bark-beetles and their Food-plants. A comparative Study. Part II.]—*Z. angew. Ent.* **21** no. 4 pp. 597–646, 4 pp. refs. Berlin, February 1935.

This second part [*R.A.E.*, A **22** 466] comprises a list of the food-plants showing the Scolytids that attack each, with alphabetical lists of the beetles and plants recorded in the two parts.

STAMATINIS (N. C.). **The Enemies of Tobacco in Warehouses.** *Ephestia elutella* Hb. and *Lasioderma serricorne* Fab. **The Biology and Measures for their Control.** [In Greek.]—*Commun. Tobacco Inst. Greece* no. 4, 65 pp., 19 figs., 1 fldg table, 52 refs. Drama, 1935. (With a Summary in English.)

Notes are given on the distribution of the Pyralid, *Ephestia elutella*, Hb., and the Anobiid, *Lasioderma serricorne*, F., which cause serious

damage to stored tobacco in Greece. The stages and life history of both are fully described. Fine and sweet tobaccos, which contain more sugar and less nicotine, are most heavily infested. *E. elutella* attacks the tobacco while it is still hanging in strings under shelters to dry and prefers the later crops, probably because unfermented tobacco is richer in carbohydrates and the tissues of such leaves contain more water and are more tender. *L. serricorne*, on the contrary, is attracted by older tobaccos perhaps because they possess a stronger odour. Tobacco baled with the stalks outwards is considerably more infested, as this method of packing allows a freer access of air and insects.

In Grecian Macedonia, *E. elutella* has three generations a year, the adults appearing in May, July and September–October. The females lay 32–267 eggs, with an average of 152, and the life-cycle from egg to adult varies with temperature. In the first and second generations the egg stage lasts 3–9 days and the larval 29–70. The larvae of the third generation hibernate in silken cocoons. The pupal period varied in 1934 from 7 days in July, when the average temperature was 27°C. [80·6°F.], to 24 in October, when it was 15·5°C. [59·9°F.]. The adults live 6–19 days. The larvae are to a great extent kept in check by the parasite, *Microbracon hebetor*, Say, which completes 8 generations from June to the end of October.

Lasioderma also has 3 generations a year in Macedonia, the adult generation appearing in May–June, July–August and from September–October. A female lays 19–73 eggs with an average of 38·6. The egg and pupal stages lasted 5–9 and 6–13 days, respectively. In the first and second generations the larval stage took from 29–50 days. The larvae of the third generation overwinter. In warehouses, the larvae and pupae were attacked by the mite, *Pediculoides ventricosus*, Newp., and tobacco bales infested with *E. elutella* and *L. serricorne* also harboured *Tenebroides mauritanicus*, L., which destroys the larvae and pupae of both species, but also bores through the tobacco leaves in search of its prey.

When different stages of *Ephestia* and *Lasioderma* were placed in tobacco in various forms and exposed to temperatures varying from 45 to 60°C. [113–140°F.] for from 15 minutes to 24 hours, 50°C. [122°F.] destroyed all stages of both insects in 24 hours. As a longer exposure, which would be necessary for an effective treatment of infested bales, would harm the tobacco, this method cannot be used in warehouses.

Experiments were therefore made with hydrocyanic acid gas generated from Zyklon B and with T-gas (90 per cent. of ethylene oxide and 10 per cent. carbon dioxide). Fumigation for 48–56 hours with Zyklon B at the rate of 4½ oz. to 100 cu. ft. killed all stages of both insects, with the exception of a few larvae of *L. serricorne* in the centre of the bales. T-gas, at the rate of 4 oz. to 100 cu. ft., penetrated the bales and killed eggs and larvae of both insects placed in the centre. About 12 tons of tobacco heavily infested with *Ephestia* and *Lasioderma* were fumigated for 48 hours with T-gas at the rate of 5 oz. to 100 cu. ft., and complete control resulted. In chemical tests tobacco fumigated with Zyklon B showed a strong reaction after being aired for many weeks and the bales smelt strongly of HCN. Traces were still apparent after 3 months. On the other hand all traces of T-gas soon disappeared from the tobacco and the place in which it had been fumigated, and there was no apparent influence on the quality of the tobacco.

HUKKINEN (Y.). **Ueber die Weissährigkeit der Gramineen. I. Streit über die Thysanopteren als Weissährigkeitserreger.** [On "White Ear" of Gramineaceous Plants. I. The Dispute as to Thysanoptera as Causal Agents.]—*Maataloust. Aikakausk.* **6** pp. 139–158, 2 figs., 39 refs. Helsingfors, 1934. (With a Summary in Finnish.)

This first paper of a series on "White ear" of grasses and cereals is a critical survey of the divergent views of the part played by Thysanoptera in producing this condition. The author considers that these insects are responsible.

DESHPANDE (V. G.). **Eradication of Prickly Pear by Cochineal Insects in the Bombay Presidency.**—*Agric. Live-Stk India* **5** pt. 1 pp. 36–42, 11 refs. Delhi, January 1935.

Data on the introduction and spread of *Dactylopius opuntiae*, Ckll. (*tomentosus*, auct.) in the Bombay Presidency during 1931–34 are set out in a table. This Coccid has been able to control *Opuntia elatior* and probably *O. dillenii* [cf. *R.A.E.*, A **19** 535] in many districts. A consignment received from Madras became well established in favourable situations [cf. **22** 380]. The Coccids increase most rapidly after showers of rain. A small number can cause very severe injury, and a fungus of the genus *Phoma* has been isolated from dying joints of the plant. The insects have been supplied to areas all over the Presidency, and they have spread successfully and destroyed the bushes in all cases where the infested joints were placed in actual contact with healthy bushes [cf. **22** 380].

CHU (Joo-tso). **Investigations on the Biology, Natural Enemies and Control of the Mulberry Coccid, *Drosicha contrahens* Walker.** [In Chinese.]—*Yearb. Bur. Ent. Hangchow* **3** 1933 pp. 77–96, 3 pls., 6 figs., 13 refs. Hangchow, 1934. (With Summary in English.) [Recd. April 1935.]

Some of this information on *Drosicha contrahens*, Wlk., in Kiangsu during 1930–31 and in Chekiang since 1932, is similar to that noticed previously [*R.A.E.*, A **22** 549]. In addition to mulberry and other food-plants it attacks oak (*Quercus serrata*) and beans (*Vicia faba*). The young larvae ascend the trunks of the trees and remain up to 2 ft. from the ground until March when they migrate to the upper twigs and destroy the buds. Both the Coccid and the Coccinellid, *Rodolia limbata*, Motsch., which preys on it, have one generation a year. The adults of the latter hibernate among crevices in the plants and oviposit in March on infested twigs. The larvae hatch early in April, feed on the Coccids and pupate at the end of May. The egg-stage lasts about 24 days, the larval 50 and the pupal 9. A spray of lime-sulphur (0.5–1°Bé) and 0.2–0.4 per cent. nicotine sulphate should be applied in late March or early April.

TATEISHI (G.). **On *Dikraneura dorsalis* Esaki, a Pest of Strawberry.** [In Japanese.]—*Agric. & Hort.* **10** no. 3 pp. 766–768, 1 fig. Tokyo, March 1935.

Dikraneura dorsalis, Esaki, the nymph and adult of which are described, injures strawberry leaves and attacks wild species of rose in Kyushu. This Jassid, which overwinters in the egg stage, seems to have several broods a year.

KUZU (S.). **Results of Studies on the Food Habits of the Birds of the Families Paridae and Sittidae. Reports on Birds and Animals, no. 7.** [*In Japanese.*]—*Chikusan Isan* no. 75 pp. 35–122. Tokyo, Minist. Agric. For., 1935.

Insects, including injurious species of several Orders, constitute more than 77 per cent. of the food of these birds in Japan.

HIROSE (K.). **On the Number of Rice-borers in Rice Straws and the Effect of Treatment of the Straws.** [*In Japanese.*]—*Insect World* **38** no. 2 pp. 49–51. Gifu, February 1935.

According to observations during the past 10 years in Japan, 15–250 larvae of *Chilo simplex*, Butl., with an average of 90, are found in the stubble of about 35 sq. ft. of rice-field, and if, as is generally considered, nearly a third of them reach the adult stage in the spring, treating the rice straws, in which they hibernate, must be of value in control.

KATSUMATA (K.) & NISHIKAWA (O.). **On *Oxya* sp., a Pest of the Rice Plant. (Preliminary Report.)** [*In Japanese.*]—*J. Plant Prot.* **22** no. 3 pp. 185–192. Tokyo, March 1935.

Oxya sp. is common in some districts of the Ishikawa Prefecture, occurring in about 20 per cent. of the rice-fields. It is primarily a pest of rice, but the adult grasshoppers also attack wheat in the autumn, as well as *Cyperus*, grasses and other plants. The eggs overwinter and hatch in late May and early June, and the hoppers reach the adult stage in 64–82 days, moulting 6 times. The females live 30–71 days, including 1–12 after oviposition, and the males 54–92. The females pair 9–26 days after emergence and begin to oviposit 8–27 days later. They pair 6–18 times and lay about 100 eggs in masses of 6–34. Oviposition usually occurs in September and continues for 11–31 days. When the rice-fields are prepared for planting in spring, the eggs deposited in them float on the water and are collected by farmers, but those deposited in other places are not destroyed. Spreading rice bran over the water causes the young hoppers to drown, and in fields in which the surface of the soil is exposed, a dust of tobacco dust and lime kills 80–90 per cent. of them.

MACHIDA (J.). **On the Development of *Crossocosmia sericariae* Corn., a Parasite of the Silkworm.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **7** no. 1 pp. 17–26. Tokyo, February 1935.

When the larva of *Sturmia* (*Crossocosmia*) *sericariae*, Rond., enters a fifth-instar silkworm [*Bombyx mori*, L.] 2 or more days after its moult, it leaves it for pupation in 15–18 days, but when it enters its host before the fourth moult it does not leave it until 9–13 days after it has begun to spin its cocoon. The parasitic larvae remain in the ganglia, but move to the spiracles after the hosts begin to pupate. Thus the larval stage is longer in parasites infesting younger hosts.

SAITO (K.). **On some Problems of "Dendro-entomology," 1.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **7** no. 1 pp. 27–34. Tokyo, February 1935.

This paper records observations made in Korea of the effect on trees of injury caused by leaf-eating insects, particularly *Dendrolimus spectabilis*, Butl., and *Dioryctria splendidella*, H.-S., on conifers.

NISHIKAWA (Y.). **On the Deterrent Action of certain Insecticides to Insects.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **7** no. 1 pp. 42–49. Tokyo, February 1935.

Silkworms [*Bombyx mori*, L.] were fed on mulberry leaves to which various insecticides had been applied and the areas eaten by them were measured. Lead fluosilicate and copper fluosilicate were repellent, but the larvae ate leaves with only a small quantity of the poison on them, and were killed. They seemed to have no negative chemotropic reaction to lead fluosilicate, but ceased almost at once to feed on leaves that had been treated with it. Sodium fluosilicate and lead arsenate were hardly repellent at all.

KAMIYA (K.). **Relation of Outbreaks of *Dendrolimus spectabilis*, Butl. to Environment.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **7** no. 1 pp. 53–55. Tokyo, February 1935.

Outbreaks of *Dendrolimus spectabilis*, Butl. [*cf. R.A.E., A* **23** 130] usually occur in hilly districts and mostly in pure forests of pine or pines mixed with broad-leaved trees. Outbreaks seem to be common in dense forests and rare in damp and low places. Usually trees in dry barren areas are more injured, and fallen leaves and grasses are comparatively abundant where outbreaks occur. *Pinus densiflora* is more susceptible to injury than *P. thunbergii*, and trees less than 20 years old are preferred.

General Results of Experiments and Researches in Afforestation in the Administration of the Bureau, II. [*In Japanese.*]—315 pp., 53 (40 col.) pls. Kumamoto, Kyushu, Kumamoto Bur. For., 1932. [Recd. March 1935.]

Illustrations and descriptions are given of over 70 insect pests attacking trees in Kyushu and the Loochoo Islands. They are recorded under their popular names only, with notes on their bionomics and control. They include *Dendrolimus spectabilis*, Butl., which is injurious to pine, but may be controlled by collecting the hibernating larvae under shelters fixed on the stems of the trees; *Dasychira* (*Orgyia*) *pseudabistis*, Butl., which attacks the seedlings of *Cryptomeria*; *Dendrolimus excellens*, Butl., which sometimes causes serious damage to oak, and also feeds on poplar; *Porthetria dispar*, L., which occurs on a variety of trees; the Geometrid, *Milionia zonea*, Moore, which defoliates *Podocarpus* in Loochoo; the Lamiid, *Batocera lineolata*, Chevr., attacking 10–66 per cent. of oak trees; the Cerambycid, *Semanotus japonicus*, Lacord, sometimes attacking 70 per cent. of *Cryptomeria*; and the Chrysomelid, *Gastrolina thoracica*, Baly, on walnut.

ESAKI (T.) & HASHIMOTO (S.). **Report on the Leaf-hoppers injurious to the Rice Plant and their Natural Enemies, No. 6 (for the Year 1934).** [In Japanese.]—*Publ. ent. Lab. Dep. Agric. Kyushu Univ.* 41 pp., 1 pl., 2 figs. Fukuoka, April 1935.

In 1934, Jassids and Delphacids were extremely scarce on rice near Fukuoka, where a serious drought occurred. The numbers caught by a light trap at the Agricultural Experiment Station at Oita, Kyushu, are shown by graphs, and the pairing and oviposition habits of *Sogata furcifera*, Horv., and the oviposition habits of *Nephotettix bipunctatus cincticeps*, Uhl., are mentioned. A Sphegid, *Alyson cameroni*, Yasumatsu & Masuda, preyed on leaf-hoppers, including the Jassids, *Mileewa margheritae*, Dist., *Cicadella viridis*, L., and *Euscelis limbifer*, Mats. The Dryinids, *Haplogonatopus japonicus*, Esaki & Hashimoto, and *Echthrodelpfax bicolor*, Esaki & Hashimoto, parasitised *Delphacodes striatellus*, Fall.; *Echthrodelpfax* oviposits on the side of the thorax or under the basal parts of the wing pads of the nymph, and seems to pass winter in the pupal stage. *Apterodryinus tambinia*, sp. n., parasitised *Tambinia debilis*, Stål, in Loochoo, and *Pachygonatopus andoi*, sp. n., was parasitic on *Deltocephalus dorsalis*, Motsch., and *Ooctonus* sp., on the eggs of *Nephotettix bipunctatus cincticeps* in Kyushu. Of 43 *Nephotettix* males with the colouring of the female type, 37 per cent. were parasitised by *Pipunculus* sp.

Experiments were conducted with the transmission of the virus of dwarf disease of rice by *Nephotettix*. First instar nymphs that were the offspring of adults that had been fed on infected plants did not cause recognisable symptoms of the disease on healthy plants, but serological experiments proved that the plants contained the virus, though the nymphs themselves had not been in contact with infected plants [cf. *R.A.E.*, A 22 59, 375]. Adults and nymphs fed on infected *Astragalus sinicus* could not cause the disease in rice plants, and the virus of *Astragalus* appears to differ from the rice virus.

FRANSSSEN (C. J. H.). **Insecten, schadelijk aan het batatengewas op Java.** [Insect Pests of the Sweet Potato Crop in Java.]—*Korte Meded. Inst. PlZiekt.* no. 20, 21 pp., 2 pls. Buitenzorg, 1934. Price Fl. 0.25. (With a Summary in English.) [Recd. March 1935.]

Of the insects that attack sweet potato in Java, only two, *Cylas formicarius*, F., and *Herse convolvuli*, L., cause serious injury. The adults of the former feed on the leaves and stalks as well as on the tubers. The larvae bore in the tubers both in the field and in store. Oviposition in harvested tubers may be prevented by covering them with a two-inch layer of fine dry earth. If rice is grown after sweet potatoes any larvae and pupae remaining in the field are destroyed by the flooding. Preference should be given to thick-skinned varieties, those that produce tubers at greater depths in the ground, and those that mature quickly and so allow the weevil less time to increase in numbers. *C. formicarius* occurs in various parts of Java and has also been found attacking *Ipomoea pes-caprae*. The larvae of *Herse convolvuli* feed on *Phaseolus radiatus* and *Vigna sinensis*, as well as sweet potato and other Convolvulaceae. It completes its life-cycle in 45 days, pupating in the soil. Collection or spraying with lead arsenate is advised, and ditches filled with water prevent migration of the larvae from field to field.

Minor pests attacking the leaves of sweet potato include a species of Thrips; *Prodenia litura*, F.; the leaf-rollers, *Tabidia aculealis*, Wlk., *Psara hippomalis*, Wlk., and *Brachmia convolvuli*, Wals., which complete their life-cycles in 24–27 days; and the Cassidids, *Aspidomorpha miliaris*, F., *A. sanctaecrucis elevata*, F., *A. amabilis*, Boh., *Metrioria catenata*, Boh., and *Cassida obtusata*, Boh. The eggs of the first two Cassidids are laid in clusters and are parasitised by a Chalcidid, while those of the other three are laid singly. All pupate on the lower surface of the leaves and feed on sweet potato and related Convolvulaceae only. The larvae of the Eumolpids, *Colasposoma metallicum*, Clk., and *Colasposoma* sp., and of the Galerucid, *Strobiderus javanensis*, Jac., feed on the roots. The adults attack the leaves. The larval stage requires 55–65 days in moist soil, and the total life-cycle 73. The eggs of *Omphisa anastomosalis*, Gn., are laid on the leaves and petioles, and the larvae bore down through the stems into the tubers. Infestation continues in harvested tubers. Pupation occurs in the plant below the surface of the soil. The egg, larval and pupal stages average 6, 35 and 14 days, respectively.

VOÛTE (A. D.). **Der Einfluss von *Ageniaspis* sp. auf ihren Wirt *Phyllocnistis citrella* Staint. unter verschiedenen (mikro-) klimatischen Verhältnissen.** [The Influence of *Ageniaspis* sp. on its Host *P. citrella* under various microclimatic Conditions.]—*Arch. néerl. Zool.* **1** no. 3 pp. 354–372, 2 graphs, 16 refs. Leiden, 1935.

Some of this information on the bionomics of *Ageniaspis* sp. parasitising *Phyllocnistis citrella*, Stn., on *Citrus* in Java is similar to that already noticed [R.A.E., A **21** 60; **23** 162]. The Encyrtid was not found in eastern Java, where the air is very dry during the east monsoon, but was common in western Java where the climate is more or less moist throughout the year. On emerging the female began to oviposit in the host larvae in their mines. Larvae removed from their mine were not touched. When the trees were growing far apart, the occurrence of parasites on them was very irregular. *P. citrella*, on the other hand, spreads rapidly. When they occurred together, *Ageniaspis* tended to replace the other parasites [**23** 162]. Only 10–15 per cent. of *P. citrella* were parasitised in seed beds under shade but left unwatered, though this percentage rose to 50 as soon as the beds were watered every morning.

BELL (A. F.). **Report of the Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd* **34** pp. 50–72. Brisbane, 1934.

In addition to the insects previously mentioned [R.A.E., A **22** 169], the pink mealybug [*Trionymus sacchari*, Kll.], *Perigrinus maidis*, Ashm., and several other Rhynchota from grasses failed to act as vectors of dwarf disease of sugar-cane in Queensland. A new outbreak of Fiji disease was discovered in December 1934. Work demonstrated that it may be transmitted by adult leaf-hoppers [*Perkinsiella saccharicida*, Kirk.] that have been bred on infected plants [cf. **21** 520], but not by those that have fed on infected plants in the adult stage only.

Climatic conditions allowed many young larvae of *Lepidoderma albohirtum*, Waterh., to survive, and they caused unusually severe damage to sugar-cane in 1934, particularly where systematic fumigation

was not carried out. The continuation of rainfall until late in the season, when most larvae had finished feeding, reduced the damage but interfered with fumigation, so that large numbers survived. Numerous adults emerged over a prolonged period from November onwards in 1933, and the larvae were correspondingly abundant early in 1934, when there was often an average of over 30 per stool. In experiments with fumigants, which were carried out unusually late owing to the wet weather, a mixture of equal parts of carbon bisulphide and para-dichlorobenzene was more effective than either of these materials alone or than carbon bisulphide mixed with orthodichlorobenzene. White arsenic (80 lb. per acre) was practically useless and was of doubtful value even at the rate of 200 lb. [*cf.* 22 169].

A trap used to capture adults in the period between emergence and oviposition, which lasts 2 weeks, consisted essentially of a large surface of galvanised iron painted white, with a collecting hopper at the base and a light in the centre. It was placed about 15 ft. from a tree of *Ficus benjamina*, by which the beetles are attracted. By illuminating the trap and shaking the boughs of the tree, up to 11,000 adults have been caught in a night during November–December, more than half being females. Examination of various soil types in Meringa indicate that most of the infestation occurs in the cane fields and that few grubs are present in the surrounding forests. Mortality continued fairly high from May, when investigations were commenced, until the end of June and decreased gradually until August. A new variety of sugar-cane has shown considerable resistance to moderate infestation by *Lepidoderma*, probably because it can regenerate roots, and to attack by *Rhabdocnemis obscura*, Boisd., because it has a hard rind and tends to mature late.

Rhabdocnemis was unusually injurious because there was a large amount of fermenting cane in the fields and the wet weather, which favours larval development, causes the leaf sheaths to cling together and thus provide shelters for the adults and prevent the Tachinid [*Ceromasia sphenophori*, Villen.] from parasitising the grubs. The parasite was also affected by fungus diseases. It appears that heavy rains during the wet season make it necessary to liberate the parasite every 2–3 years in certain areas, since practically all the cane is harvested during the season and no tall plants remain in which it can maintain itself permanently as in other countries. Since the beginning of July, 2,500–3,000 flies have been released per month in infested fields in the north. The material for breeding is obtained by collecting puparia [22 169], adjacent borer larvae, which almost invariably contain parasite larvae, and the adult flies during cloudy weather. A total of 1,455 weevils was caught in 6 traps of split cane sticks between 3rd July and 8th September. It appears that a greater number are caught during showery weather. The traps were slightly more effective if they were lightly covered with trash, but their efficiency was small after 30 days. Preliminary experiments indicate that sour cane makes a more attractive trap than fresh material. Traps should be used systematically near standover cane left for the conservation of parasites, in order to prevent the migration of the weevils to the surrounding cane fields.

Some injury to plant cane was caused by *Opogona glycyphaga*, Meyr., but it appeared to be of minor importance. *Metoponia rubriceps*, Macq., was more abundant than it has been for 8 years, probably because wet weather in winter and spring favoured the eggs and

young larvae. Infested land should be ploughed while the Stratiomyid is in the prepupal and pupal stages, a dry surface mulch should be maintained after the adults have emerged, and cane in blocks near infested areas should be of about the same age to avoid the migration of flies from an old ratoon to a young plant crop and the consequent maintenance of a dense population from year to year. *Phragmatiphila truncata*, Wlk., was present in many fields in one district, and was often mistaken for *Rhabdocnemis*. No pupal parasites were observed during August, but 5 out of 253 larvae were parasitised by *Apanteles flavipes*, Cam. (*nonagriæ*, Oliff). The moth is seldom very injurious. Wireworms [*Laeon variabilis*, Cand., cf. 23 202] caused slight damage to plant cane in low-lying parts of fields in one district.

JARVIS (H.). **Codling Moth Control by Non-arsenical Sprays.**—*Qd agric. J.* 43 pt. 1 pp. 5-8; also as *Pamphl. Div. Ent. Dep. Agric. Qd* no. 21, 4 pp. Brisbane, January 1935.

Tests were carried out in Queensland in 1932-33 [*R.A.E.*, A 21 570] and 1933-34 to discover a satisfactory substitute for lead arsenate against *Cydia pomonella*, L., on apple. In the second season the materials were the same as in the first, but 5 applications were made at the rate of $\frac{1}{2}$ gal. to a tree, and in each case one calyx spray of lead arsenate (2 lb. to 40 gals. water) was applied on 25th October 1933. All the spraying was done during sunny weather, but rain occurred very soon after each of the first 4. In an additional test, potash soap (2 lb. to 32 gals. water) was applied 5 times without a previous application of lead arsenate. *C. pomonella* was more troublesome in most orchards than during the previous season. The percentages of sound fruit at the time of picking on trees that had received the various treatments were as follows: barium fluosilicate (1 lb. : 40 gals.) 55.5, nicotine sulphate and white oil (1 : 8 : 640) 93.9, white oil (1 : 100) 69.8, lead arsenate (1 lb. : 40 gals.) 84.6, potash soap 80.4, controls 25.6. Nicotine sulphate in combination with white oil gave a higher percentage of control than lead arsenate during both seasons. Its high efficiency, combined with its value as a fruit-fly repellent, renders it a promising substitute for arsenical sprays in spite of its high cost, but the cumulative ill effects of repeated applications of oil must be further investigated before making final recommendations. It is believed that the calyx treatment with a double strength lead arsenate spray is of great importance.

The Javanese Beetle *Plaesius javanus* Predator of Banana Borer introduced from Fiji.—*Agric. Gaz. N.S.W.* 46 pt. 1 pp. 18, 30, 1 fig. Sydney, 1st January 1935.

An unsuccessful attempt was made about 20 years ago to introduce *Plaesius javanus*, Er., into New South Wales to control *Cosmopolites sordidus*, Germ., on bananas. In 1913 it was successfully introduced into Fiji [cf. *R.A.E.*, A 2 507], and it was thought that after it had become acclimatised there it would be more likely to survive in New South Wales. A survey of the incidence of the weevil in Fiji in 1934 showed that in spite of the prevalent haphazard methods of cultivating bananas, it was not nearly so abundant as expected, and this is attributed to the presence of *P. javanus*. A consignment of the Histerid was therefore brought to New South Wales, and 550 adults have been liberated.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **46** pts. 1–2 pp. 19–23, 6 figs.; pp. 105–109, 5 figs. Sydney, 1st January 1935 & 1st February 1935.

The first set of these notes [*cf. R.A.E.*, A **23** 201], deals briefly with the bionomics and control in New South Wales of *Chrysomphalus aurantii*, Ckll., on Citrus, *Cydia pomonella*, L., on apples and pears and *Phyllocoptes lycopersici*, Tryon, on tomatoes. The mite may be controlled by sprays of lime-sulphur (1:100) or atomic sulphur (1 lb. to 12 gals. water) or by a fine sulphur dust mixed with an equal quantity of hydrated lime or kaolin. Where Bordeaux mixture is used, lime-sulphur should be avoided as it reacts with the mixture.

The second contains information on *Ceroplastes destructor*, Newst., on Citrus and other shrubs and trees, and *Agromyza phaseoli*, Coq., on beans.

PROVAN (J. L.). **Fumigation of Citrus Trees.**—*J. Dep. Agric. Vict.* **32** pt. 12 pp. 613–619, 633; **33** pt. 1 pp. 5–16, 9 figs., 8 tables, 7 refs. Melbourne, December 1934 & January 1935.

This paper is a critical description of the use of calcium cyanide [*cf. R.A.E.*, A **18** 653] against *Aonidiella (Chrysomphalus) aurantii*, Mask., the life-history of which in Victoria is briefly outlined, in relation to methods of fumigating, equipment used and the preparation of Citrus groves before fumigation. Calcium cyanide in the form of Cyanogas "A" dust (CN content 25 per cent.) and of Calcid briquettes (CN content 50 per cent.) have both given good results in Victoria. Dosages of both are shown for trees of 8 different sizes fumigated at a temperature above 70°F. and a relative humidity of over 60 per cent. Where Calcid briquettes are used, no measuring equipment is necessary, as the dosage is expressed as so many briquettes per tree. Irrigation should be completed about 3 weeks before fumigation and the surface of the soil should be dry, since damage results from an excess of humidity during fumigation. A fine tilth enables the sheet to rest evenly on the surface of the soil. The trees should be thoroughly pruned. Weeds may make fumigation less effective by absorbing the gas and by constituting a source of re-infestation to recently fumigated trees. Ornamental palms, vines, roses, etc., also constitute sources of re-infestation, and if they cannot be fumigated, they should be sprayed with white-oil emulsion. If mature oranges are not gathered before fumigation, green fruit may be re-infested from them.

In the second part of the paper charts suggest the dosages for different climatic conditions, and a sketch is given of the way in which these dosages may need to be modified in view of the rate at which the gas evolves, the presence of wind and water, and rapid falls in concentration because of the porousness of the tent or leakage. There is also a brief note on the way to apply Cyanogas "A" dust. The conditions under which a citrus tree can withstand a concentration of gas sufficient to kill the scale are described [*cf. 9* 310]. Of a number of trees mentioned, lemon, grapefruit and seedling oranges were the most resistant to liquid HCN. Lemon is more susceptible to injury by Cyanogas "A" dust [*cf. 16* 681], which leaves a heavy residue on fruit and foliage. Suggestions are made for decreasing or eliminating some types of injury. Fumigation should not follow applications of Bordeaux mixture. Where infestations are heavy, fumigation may

be preceded by sprays of white oil emulsion. In some cases they have given adequate control without subsequent fumigation when they were applied during January–February and again in April–May.

PESCOTT (R. T. M.). **Insect Control. The Part of Insecticides.**—*J. Dep. Agric. Vict.* **33** pt. 1 pp. 23–36, 41, 5 figs. Melbourne, January 1935.

In this general account of the use of insecticides, the relative merits of spraying and dusting are first discussed and analytical descriptions are then given of some stomach and contact poisons.

SIMMONDS (H. W.). **Biological Control of noxious Weeds, with special Reference to the Plants *Clidemia hirta* (the Curse) and *Stachytarpheta jamaicensis* (Blue Rat Tail).**—*Agric. J. Fiji* **7** no. 1 pp. 3–10, 2 refs. Suva, 1934. [Recd. March 1935.]

The biological control of noxious weeds by insects is discussed with special reference to the control of *Clidemia hirta* by *Liothrips urichi*, Karny, in Fiji [*cf. R.A.E.*, A **20** 380]. A survey in 1934 showed that since the introduction of this thrips in 1930 [**18** 616] useful plants had taken the place of dense growths of the weed over large areas. The insect is still spreading but has little effect in very wet areas, under dense shade [*cf.* **21** 625] or in areas where grazing is heavy, because the competing vegetation is unable to overgrow the weed.

Stachytarpheta jamaicensis, which forms 10–25 per cent. of the surface cover in poor grazing lands, is partly controlled by *Haplothrips gowdeyi*, Frankl., and *Aulacaspis* (*Diaspis*) *pentagona*, Targ. A Cecidomyiid, which destroys the seeds in Trinidad, failed to breed in captivity. Of four insects introduced from Hawaii [*cf.* **18** 11] to check *Lantana camara* and *L. crocea*, *Ophiomyia* (*Agromyza*) *lantanae*, Frogg., which destroys the seeds, and *Callicista thius*, Hb. (*Thecla agra*, Hew.), which attacks the flower buds, have become well established, but *Teleonemia lantanae*, Dist., is only effective in dry weather and *Tmolus* (*Thecla*) *echion*, L., has failed to establish itself. Planting the large leaf form of mahogany, *Swietenia macrophylla*, is recommended for the control of guava (*Psidium guayava*), which is a serious menace to the citrus industry on account of fruit-flies breeding in its fruits.

PAINE (R. W.). **The Control of Koster's Curse (*Clidemia hirta*) on Taveuni.**—*Agric. J. Fiji* **7** no. 1 pp. 10–21, 1 pl., 3 graphs. Suva, 1934. [Recd. March 1935.]

Clidemia hirta, first noticed on the island of Taveuni in 1916, had by 1930 become a menace on coconut plantations, where the dense scrub it formed had to be cleared before the nuts could be gathered. *Liothrips urichi*, Karny, was liberated in 1930 [*cf. R.A.E.*, A **18** 616] and by the end of 1931 was well-distributed over the Island. Rapid destruction of *Clidemia* followed, but during the wet season of 1932 it spread again and has maintained its growth for the last two years. When the weed grows near sea-level, the thrips prevents the bushes

from producing much fruit, but at altitudes above 200 ft. it is not very effective. According to data furnished in graphs the numbers of the thrips increase from July to October and then decline until November after which they remain steady during the early part of the year. After heavy rainfall the weed grows very fast and the density of the thrips population is correspondingly reduced. *Clidemia* is still of importance on the higher ground, and it is recommended that in such places cattle should be temporarily removed, in order to allow useful fodder plants to replace the weed after it has been smothered by the competing vegetation [see preceding paper]. Elsewhere there seems to be a balance between the plant and the thrips.

PAINE (R. W.). **Entomological Notes.**—*Agric. J. Fiji* **7** no. 1 pp. 39–41. Suva, 1934. [Recd. March 1935.]

In September 1933 *Xyleborus perforans*, Woll., was found damaging the trunk of a coconut palm at Taveuni. This is the first record of the insect from Fiji. The holes had been noticed before, but no damage was done as they were blocked up by a gummy substance exuded by the tree. In this instance, a caterpillar that feeds on rotting wood had bored extensively into the outer part of the trunk and ventilated the galleries of the Scolytid, which had bred in large numbers.

Xyleborus morstatti, Hag., which was first observed on avocado pear [*Persea gratissima*] in Taveuni in 1931 and caused extensive damage in 1933 [cf. *R.A.E.*, A **21** 625], bores into the twigs. These die back from the tip, and the leaves wither.

PREBBLE (M. L.). *Actia diffidens* Curran, a Parasite of *Peronea variana* (Fernald) in Cape Breton, Nova Scotia.—*Canad. J. Res.* **12** no. 2 pp. 216–227, 31 figs., 13 refs. Ottawa, February 1935.

A Tachinid parasite of the larvae of *Peronea variana*, Fernald (black-headed budworm) that was fairly common in 1930 and of considerable importance in 1931, during an outbreak of the host on conifers in Nova Scotia, was identified as *Actia diffidens*, Curran, from adults reared from overwintering puparia in 1932 after the outbreak had subsided. The immature stages (including three larval instars) are described, and there is a note on the integumental funnel, an ingrowth of the host's body wall, which is developed in response to irritation and appears as a black disc on the mesothorax. In the laboratory the flies emerged in late May and early June. Parasitism probably begins in the field in late June and is heaviest during the first half of July. Mature larvae leave the dead hosts between mid-July and mid-August and form puparia on the forest floor.

Larvae of *Actia* were recovered in small numbers from isolated third instar larvae of *Peronea* and in larger quantities from those isolated in the fourth and fifth instars. They were found in the first and second instars living freely in the body cavity of the fourth and fifth instar host larvae. Many second and all third instar larvae of *Actia* were enclosed in the funnels. The larva does not harm the host much until the last 2–3 days, when it devours most of the organs and tissues. Almost invariably only one parasite is found in a host.

HASEMAN (L.) & JONES (E. T.). **Greenhouse Pests and their Control.**—*Bull. Missouri agric. Exp. Sta.* no. 342, 32 pp., 14 figs. Columbia, Mo, November 1934. [Recd. March 1935.]

Notes are given on the habits of the chief insect and other pests of greenhouse crops in Missouri and the measures effective against them, together with a general account of the methods of controlling greenhouse pests.

Dutch Elm Disease Quarantine. Notice of Quarantine No. 70. (Revised).—*U.S. Dep. Agric. B.E.P.Q.*, Q. 70, 2 pp. Washington, D.C., 1st January 1935. [Recd. March 1935.]

As it has been found that the complete removal of all vestiges of bark from elm veneer logs, made a condition of entry in the original quarantine order to prevent the introduction into the United States of Scolytid beetles known to be carriers of *Ceratostomella* (*Graphium*) *ulmi* [*R.A.E.*, A 22 34], has not been effectively accomplished in the majority of shipments, this quarantine has been revised to exclude all elm veneer logs. It prohibits the importation from the Continent of Europe of seeds, leaves, plant cuttings, scions, or logs of elm or any other plant of the family Ulmaceae, the wood of these plants in any form and containers if not free from bark. Exceptions to these prohibitions may be authorised for entry under permit under such conditions and regulations as may be prescribed, or when the particular article has been so treated that its unrestricted entry is considered to involve no risk of pest introduction.

GILBERTSON (G. I.). **The Plum Tree Borer** (*Synanthedon pictipes* G. & R.). **Its Distribution, Life History, Economic Importance and Control.**—*Bull. S. Dakota agric. Exp. Sta.* no. 288, 22 pp., 10 figs., 15 refs. Brookings, S. Dak., June 1934. [Recd. March 1935.]

An account is given of work carried out on *Aegeria* (*Synanthedon*) *pictipes*, G. & R., in South Dakota, much of which has been noticed previously [*R.A.E.*, A 15 600; 16 637]. This Aegeriid is widely distributed in South Dakota, where it is one of the chief pests of plum trees, causing many to die early. All stages are described. Natural enemies, which include *Microbracon dorsator*, Say [*cf.* 15 601], do not succeed in controlling it. The trunks and larger limbs should be painted with 1 lb. paradichlorobenzene mixed with 4 lb. liquified paraffin wax [16 627]. Alternatively, the infested areas may be scoured and then coated with a paste of paradichlorobenzene and cottonseed oil (1 lb. to 2 U.S. quarts) [*cf.* 21 346; etc.]. These treatments are made from the end of July until the beginning of September against the larvae.

Grillo que ataca los frutos del cafeto. [A Gryllid attacking Coffee Berries].—*Rev. agric. Guatemala* 13 no. 1 pp. 10–11, 2 figs. Guatemala, 31st January 1935.

In view of injury to coffee berries by Gryllids in San Salvador and Guatemala the usual measures for control are recommended. The formula for a poison-bait is 200 lb. bran, 7½ lb. arsenic, 3 gals. molasses, the juice of 45 oranges or lemons and 10 gals. water.

PAPERS NOTICED BY TITLE ONLY.

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- SMITH (R. H.). **Possibility of Controlling Codling Moth** [*Cydia pomonella*, L.] with Nicotine Vapor.—*Proc. Wash. St. hort. Ass.* **30** (1934) pp. 72-75, 1 fig. Pullman, Wash. [1935.] [Cf. *R.A.E.*, A **23** 179.]
- GRISWOLD (G. H.). **The Control of Aphids on House Plants**.—*Cornell Ext. Bull.* no. 162 (revd), 15 pp., 8 figs. Ithaca, N.Y., N.Y. St. Coll. Agric., January 1935. [Cf. *R.A.E.*, A **16** 405.]
- SMITH (R. C.). **A Summary of published Information about Pharaoh's Ant** [*Monomorium pharaonis*, L.], with Observations on the Species in Kansas.—*Trans. Kans. Acad. Sci.* **37** pp. 139-149, 27 refs. Manhattan, Kans., 1934.
- ALFIERI (A.). **Sur une nouvelle maladie du dattier**. [The Tropic-duchid, *Ommatissus binotatus* var. *libycus*, Bergevin, on Date Palms in Egypt.]—*Bull. Soc. ent. Égypte* **18** fasc. 4 pp. 445-448, 5 figs., 4 refs. Cairo, 1934. [Recd. March 1935.] [Cf. *R.A.E.*, A **22** 190.]
- HEPBURN (G. A.). **Combating Fruit-flies**. [Baits against *Ceratitis rosa*, Ksh., and *C. capitata*, Wied., in S. Africa.]—*Fmg in S. Afr.* 1934, reprint no. 91. Pretoria, November 1934. [Cf. *R.A.E.*, A **18** 421; **19** 707; **20** 450.]
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- YAGI (M.) & KATSUMATA (K.). **On the Determination of the Larval Instars of *Chilo simplex*, Butl. by the Breadth of the Head and Mandibles**. [In Japanese.]—*Oyo-Dobuts. Zasshi* **7** no. 1 pp. 35-41. Tokyo, February 1935.
- MIMEUR (J. M.). **Aphididae du Maroc (Cinquième note)** [including two new species].—*Bull. Soc. Sci. nat. Maroc* **14** (1934) no. 7-8 pp. 178-190, 8 figs. Rabat, 1935.
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- GUNN (D. L.). **The Temperature and Humidity Relations of the Cockroach : iii. Respiration of *Periplaneta americana*, *Blatta orientalis* and *Blattella germanica***.—*J. exp. Biol.* **12** no. 2 pp. 185-190, 1 graph, 1 fig., 10 refs. London, April 1935. [Cf. *R.A.E.*, A **23** 104.]

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